

AUTOMOTIVE INDUSTRIES

AUTOMOBILE

Published Weekly
Volume 72
Number 9

Reg. U. S. Pat. Off



JULIAN CHASE, Directing Editor
DON BLANCHARD, Editor
P. M. HELDT, Engineering Editor
JOSEPH GESCHELIN, Eng. Editor
HAROLD E. GRONSETH, Detroit News Editor
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GEOFFREY GRIER, Art Editor

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C. A. MUSSELMAN, Pres. and Gen. Mgr.; J. S. HILDRETH, Vice-Pres. and Director of Sales; W. I. RALPH, Vice-Pres.; G. C. BUZBY, Vice-Pres.

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Automotive Industries—The Automobile is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

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CHILTON COMPANY
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Executive Offices

Chestnut and 56th Streets, Philadelphia, Pa., U. S. A.

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WILLIAM A. BARBER, Treasurer. JOHN BLAIR MOFFETT, Secretary

March 2, 1935

How a man's short memory staged a marvelous demonstration—

LOST IN
A DESK
DRAWER
2 YEARS



This AIR-DRY FINISH did not BRITTLE or FLAKE

One of our very active customers, eight years ago, was just a prospect. At that time he received from us three metal strips (steel, brass, aluminum) finished with BLUE KNIGHT FLEXIBLE ENAMELS. The finish looked interesting; seemed flexible; appeared to have good adhesion... so he put them in a desk drawer. *Two years later he found them again!*

After two years in a desk drawer the finish did not brittle. It stood bending, twisting, finger-nailing. And it did not peel, flake or chip.

ANOTHER CONVINCING DEMONSTRATION

A metal sheet sprayed with this same one-coat flexible finish (AIR-DRY) spent two years in constant temperature steam oven at 212°F. And this accelerated aging test proved that after two years at 212°F., the finish still retained its original flexibility and adhesion!

Since 1924, BLUE KNIGHT FLEXIBLE ENAMELS have been successfully used in many of the metal-working industries.

The report is unanimous that no other finish stands assembling operations, where screws, tools and rough handling are involved, with such certainty that the finish will not chip, flake or peel.

Ask us to send you three metal strips which you can twist, bend, finger-nail or abuse as you see fit. A booklet titled "How Good Are You at Twisting and Bending" will accompany the strips.

ROXALIN

Flexible

CELLULOSE & SYNTHETIC FINISHES

806 MAGNOLIA AVE.

ELIZABETH, N. J.

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Automotive Industries

2 Mos. Output Scores 58% Gain

First Gas Tax Levied In Oregon 16 Yrs. Ago

The gasoline tax had a birthday on Monday of this week. Since it was first imposed on Feb. 25, 1919 by the State of Oregon, it is estimated that \$4,620,000,000 have been paid in state and federal gasoline taxes.

January Output Best for That Month Since 1929

Production in January reached the highest level for that month since 1929 with a total output in the United States and Canada of cars and trucks of 303,372. This is the largest monthly total since June last year and compares with 185,919 in December and 163,811 in January, 1934.

Truck production amounted to 65,904, the largest January total in the history of the industry, and the biggest monthly

First Quarter Production Expected to Top '30 Mark

Having produced approximately 58 per cent more cars and trucks in the first two months of 1933 than in the same period a year ago, the automobile industry is believed well on its way toward an output in March of more than 400,000 units. The last time that assemblies topped that mark was in May, 1930. If projected schedules are achieved this month, the total in the first quarter will be the best for a similar quarter since 1929, slightly exceeding the 1,046,689 units turned out in the first quarter of 1930.

figure since April, 1934. In December, truck output was 55,526 and in January last year, 45,213.

Passenger car production was the largest in any January since 1929. The total was 237,468 against 130,393 in December and 118,598 in January, 1934.

Despite the swift production pace maintained by the industry, there is little indication that stocks in dealers' hands are accumulating rapidly. Several important makers declare that dealers are continuing to crowd factories for prompt deliveries and the end of this tight situation is not yet in sight. In the case of one company which has been slow in getting started, orders are said to have piled up far beyond the capacity of the plant. The only exception is a car manufacturer which got under way early and therefore has been able to build up comfortable stocks in the field. As a consequence its operations have eased a bit in the past week.

It still appears that April will be the peak production month of the year although output should be relatively high throughout the entire first half. The fact should be borne in mind, of course, that comparisons with a year ago are somewhat deceiving, because the tool and die strike as well as other difficulties then prevented factories from putting many cars into the field and hence retail sales suffered. Where percentage gains in production and sales this year have pyramided, it is only natural to expect that as the spring season progresses, the improvement over a year ago will not be so sensational as it has been. If sales continue in the volume anticipated, there is a strong possibility that a used car problem may arise. Thus far dealers have been able to move in fairly good numbers the old cars traded in on new car transactions. Just

(Turn to page 315, please)

Widespread Strike Possibilities Fade as Green Adopts More Pacific Attitude

Although sporadic strikes may break out here and there in individual car or parts plants, chances of a strike of major proportions seem to be rapidly disappearing. The statement of William Green, president of the A. F. of L. in Detroit last Saturday that "We are not talking strikes, but are thinking in terms of peace" is interpreted as meaning that the Federation thinks it inadvisable at this time to attempt to "pull" a big strike.

The reasons for this strategy are not too apparent. It is believed that Mr. Green's reception in automotive cities last week was not overly enthusiastic and that this fact may have had a bearing on his conciliatory attitude. On the other hand it is no secret that the White House is strongly desirous of at least some measure of business recovery in the immediate future and would be expected to look with disapproval on deliberate efforts to bring present automotive operations to a halt. Mr. Green's

open avowal of peace, therefore, may have been a gesture toward President Roosevelt to reassure him that his tour of the automotive district was not primarily to stir workers into striking. It is entirely likely that Mr. Green, after surveying the automotive scene, decided that his organization possesses too little strength at present to win an open contest with the industry and that the best thing to do is to bide his time and be content with "making faces" at the manufacturers and letting the matter go at that.

At any rate the "peace-loving" declarations of Mr. Green in Detroit sounded peculiar after the belligerent speeches he made in other cities. In fact, the same day that he sounded the peace note his right-hand man at Detroit, Francis J. Dillon, was publicly stating that workers shortly would avail themselves of the only weapon left at their command, naturally referring to an attempted strike. The National Council of the United Automobile Workers Federal Unions is still in session in Detroit and it is understood on good authority that it has

(Turn to page 315, please)

Henderson Automotive Study R

Holding their fire until a thorough analysis of the Henderson report had been completed, the car makers last week cut loose with a double-barreled attack on NRA's opus on automotive employment conditions.

In a vigorous letter to S. Clay Williams, chairman of the National Industrial Recovery Board, Pyke Johnson, vice-president of the Automobile Manufacturers Association, speaking for the industry, protested the making and dissemination of such a document by a Government Board and expressed the amazement and regret of the industry "that, when there are such acute economic problems pressing for solution, the existing difficulties should be multiplied and the minds of the public and the employees of the industry confused by an investigation, the intended purpose of which must have been the clarification of problems and the discovery of means whereby they might be more easily solved to the benefit of all concerned."

Simultaneously with the release of Mr. Johnson's letter, W. S. Knudsen, GM's executive vice-president issued an equally vigorous statement in which he said that it seemed "appropriate for some one with experience to point out some of the ridiculous assertions of the report and to recommend that if any more investigations are made, the statements made in the proposed report be checked before it is brought out and be closer to the facts when it does get out." Pointing out that any hasty analysis of an industry as big as the automotive is bound to lead to more or less incorrect conclusions, Mr. Knudsen declared. "This is especially true when the men working on the study have no previous experience with the industry. In fact, some of the men who did major work on the Henderson report had never been in an automobile plant even as a sightseer."

Asserting that the investigators doubtless were deceived by the bulk of testimony offered by A. F. of L. organizers and A. F. of L. sponsored witnesses, Mr. Johnson charged that "This testimony and these witnesses were so marshalled not because the facts were true, but because the American Federation of Labor sought to make the investigation a means of promoting its organizing campaign. . . . Doubtless the investigators could not imagine the recklessness of the statements that the witnesses of

the American Federation of Labor made to them. The one correct conclusion in the report, about the advantage of changing the time of introducing models, the investigators took bodily from a report the manufacturers had made for themselves earlier and had let the investigators have, and on which the industry had been working for some time at the request of the Federal Government."

Continuing Mr. Johnson refutes in detail the report's charges that the industry discriminates against older workers, that workers are not properly protected in their seniority, and that large numbers of workers are being displaced by technological advances and the speed-up. He also discussed annual earnings. The replies which Mr. Johnson made on these points for the car makers follow:

"No more serious indictment could be brought against an industry, particularly in times of general unemployment, than that the managers of the industry have adopted the deliberate policy of discarding, because of age, employees who have worked for them for a long time. In many places in the report references are made to this policy as if there were evidence that the policy was in force in the industry. In one place, for instance—Page 6, Summary—they state that the 'automobile industry has set a new "low" age for displacement of workers. Men near 40 find great difficulty in securing jobs with the industry, or being rehired after lay-offs.' Nowhere in the report is there supplied any evidence whatsoever that this is the fact or that it is the policy of any company in the industry. The data employed to support this point are open to such serious criticism and modification that one wonders how men of professional standing and competency could have used them in the loose way in which they were used. The report, for instance, states with reference to a table included in it, that a much higher percentage of persons in receipt of relief in Detroit are in higher age groups than is true in New York, Chicago and Los Angeles. This statement, without doubt, leaves the impression in the mind of any reader of a vast disparity of the age distribution of the relief recipients in Detroit and in the other cities with which it is compared. In the report's own table, however, the percentage of those in receipt of relief who are over 44 years of age is 48 per cent in Detroit and 46 per cent in Chicago. Furthermore, in the age group of 55 years and over, the Detroit percentage is lower than in any of the other cities, being 15 per cent, whereas it is 17 per cent in New York, 21 per cent in Chicago and is 19 per cent in Los Angeles. On this matter the report fails to point out that there are innumerable elements in the situation which could more satisfactorily explain the variations among these figures produced by it than the age distribution of automobile workers, but very obviously this table was taken and published without giving it careful examination. It is, moreover, a matter of common knowledge that, in the period from 1920 to 1929, the Automobile Industry was one of the few manufacturing industries which increased substantially in the number of people employed, whereas

manufacturing industry, as a whole, showed either a decline in total employment or remained stationary. Being among the youngest industries of the country, the Automobile Industry must necessarily show a somewhat younger distribution of ages than is true of other industries. There is certainly nothing in the available data which would support the contention of the report that workers are discarded in the Automobile Industry 10 to 20 years before they are discarded in other industries. The records of one of the three largest automobile companies show that in the year ending Sept. 1, 1934, it had 129,564 factory hourly rated employees on its payroll, of whom 31,093, or 24 per cent, were over 40 years of age.

"The whole question of the age distribution of automobile workers is closely connected with the application of seniority rules in the hiring and laying off of employees in this industry. Whatever may

Industry service seniority rules would be summarily rejected by the overwhelming majority of automobile workers.

* * *

The total man-hours per car produced by AMA members were greater in 1934 than in 1929, despite the trend to the low-priced car.

* * *

It takes four per cent more man-hours to build a body for a typical low-priced car in 1935 than were required for a similar body in 1929.

have been the state of affairs in the industry prior to the spring of 1934, since that time automobile workers have been hired and laid off in accordance with their seniority standing. We submit that this is true of few industries in this country. In its discussion of the seniority rules which prevail in the industry, the report states—Page 5, Summary—that 'Under the present seniority rules, a worker's seniority status applies only at the company which employed him last.' This statement is not in accordance with the facts and any slight investigation of the rules and of their application would have revealed the true facts. Following this inaccurate statement the report goes on to say that 'If a worker, with seniority, loses his job for any reason, his possibilities at present for employment with other companies are limited to peak periods when all workers with seniority status have been rehired.' The conclusion which the report evidently desires to be drawn from this statement, but which it does not undertake itself to draw, is that the seniority rules in the industry should apply to industry service and not plant service as at present. Anyone familiar with conditions prevailing in the industry would well know that industry service seniority rules would wholly destroy seniority, and it is a fact of common observation to those who have been close to the automobile labor situation, that industry service seni-

There are over 90,000 men over 40, working in the industry now. These men are protected by seniority rules.

* * *

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Riddled by Car Makers

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"By the citation of scraps of information obviously collected without care and without understanding, the report attempts to convey the impression that a substantial proportion of workers in the automobile industry are currently being displaced by changes in the methods of manufacture, by speed-up and by introduction of machinery. In one of its striking illustrations of the assumed reduction in labor cost, the report states that 'The estimated labor saving is 50 hours for the manufacturing and assembling of certain parts which are entirely eliminated by the one-piece stamping of the underbody.' When the fact is that the total man-hours per car produced by the members of the Automobile Manufacturers Association in 1934 were greater than the total man-hours per car produced in 1929, in spite of the fact that the trend of the industry since 1929 has been toward the low-priced car. Technological improvements, of course, have been great in the Automobile Industry, but they have not reduced employment. Such improvements are absolutely essential for the maintenance of employment and wages in this industry. Without such improvements the industry could not have sold so many cars and, therefore, would have provided less employment. In the light of the facts as to man-hours per car in 1934 as compared with 1929, and other data of similar purport, it is clear that the sweeping indictment of the industry on the ground of an alleged inhuman speed-up of operations is wholly unsupported by factual evidence.

"The whole question of the relation between wages and annual earnings is one of the most complicated in the whole American business situation. In order to observe the letter and the spirit of the policy of the National Recovery Administration, the Automobile Industry throughout 1934, spread the available volume of work among as large a number of employees as possible. The fact that it did so is proved by comparing the total volume of output of this industry with the number of persons employed in producing that output in 1929 and in 1934. The industry was always aware of the fact that the continued spreading of work would result in a reduction of the annual earnings of its employed work-

ers, no matter how high the rate of hourly earnings, and this fact has on more than one occasion been a subject of discussion between representatives of the industry and representatives of the Federal Government. In spite of the plain relationship between work-spreading and the prevailing annual earnings of automobile workers, the report recommends a further reduction in the maximum hours of work for this industry. It is clear, from the experience of this industry, as well as from others, that reduction in the length of the maximum work-week cannot have the effect of increasing the earnings of labor but must necessarily result in their reduction, first, because a larger number of persons will be employed than are required, and, second, because the reduction of the length of the work-week is bound to reflect itself in a rise in costs and selling prices and, therefore, finally in a reduction in the total volume of business done by automobile companies. The report disregards this fact in recommending a shorter work-week, which clearly would prevent higher annual earnings and thus would defeat the purpose of regularization. For the benefit of the many people who, by this time, will have read the report and for those who have seen the summary of it in the newspapers, it should be worth pointing out that the figures regularly compiled by the National Industrial Conference Board show that the average hourly earnings in the Automobile Industry at the close of 1934 were 76 cents whereas for all manufacturing industries they were 59 cents."

Knudsen Dissects Charges

In his statement which follows in part, Mr. Knudsen met the charge that life ends at 40 in the automobile plants, demolished some of the assertions made as to the extent men were being displaced by machines and discussed the regularization problem:

"The first section of the report deals with the assertion that men over 40 have no place in the industry and that they are being discarded as fast as possible. This, of course, is not true. There are over 50,000 men over 40 working in the industry now. These men are protected by seniority rules as administered by the Labor Board, and are not discriminated against.

"The industry does not get rid of men over 40. The industry has many men of 40 and over—even in the sixties—in good health, with many years experience.

"Those who have grown up in the automobile manufacturing centers know that the industry, being young, only became a large employer of labor in the years 1915 to 1920, so if a man of 20 started in the early period of volume production, he would today be around 40 years old.

"The Henderson report is unjust to men over 40, and unjust to the men that hire them. It is a fact that relief records of other cities about the size of Detroit show that the percentage of older men is lower in Detroit than elsewhere.

"A set of statistics in Appendix B of the report purports to show that a lot of men have been eliminated in the cost of building an automobile, through technical advances made between 1929 and 1934. As an instance, an estimated saving of 50 hours is



W. S. Knudsen
executive vice-president of
General Motors

shown on the under part of the body, and a saving of 53 hours is shown in the so-called 'one-piece top.' This makes a total of 103 hours saving since 1929.

"Anyone who knows anything about the building of automobile bodies knows that the total time for building a body, be it 1929 or 1935, is not anywhere near 103 hours. As a matter of fact, the total time for the work done in the body plant in 1929, for the average low-price car, was 33.4 'man-hours.' The time for a similar body in 1935 is a trifle over 40 hours, or an increase of 4 per cent in total man hours, and a saving of 103 hours would be a ridiculous assertion.

"Costs given elsewhere for operations of the body, such as framing and hand-finishing, door-hanging and trimming, do not jibe with records that the industry possesses and must be based on wrong information or wrong distribution of time.

"In the report, a description is given of an automatic buffing and polishing machine which turns out 12,000 to 14,000 pieces per eight-hour day with five men. It is also stated that before the machine was installed the work was done by hand, one man turning out from 600 to 700 pieces per eight-hour day, and then it is claimed that the machine saves 150 men.

"This deduction ignores fourth-grade arithmetic. If all the facts were as stated, 14,000 pieces would take 20 men, by hand. The machine takes five men, and the saving would be 15, instead of 150.

"Right below, the same errors are repeated.

No Defense Needed

"The industry need make no defense of labor-saving devices. The fruits of these devices make work lighter and are given to the public in the shape of cheaper motor cars or better motor cars for the same price, thereby creating greater new car sales and consequently greater employment.

"But manufacturing of motor cars has passed beyond where savings of hundreds of men can be effected on one process or hundreds of hours on any one unit. The industry is working with very small percentages, which is only natural after having been developing quantity production for many years. Were it possible to effect such savings at this stage, we certainly would have been backward in our work up to now.

"The report deals a lot with annual earnings for the men, and stresses the fact that employment is uneven, with great peaks and valleys. No thinking man that

Manufacturing of motor cars has passed beyond where savings of hundreds of men can be effected on one process or hundreds of hours on any one unit.

* * *

When the public wants cars, the industry should build them and furnish the employment to the men.

* * *

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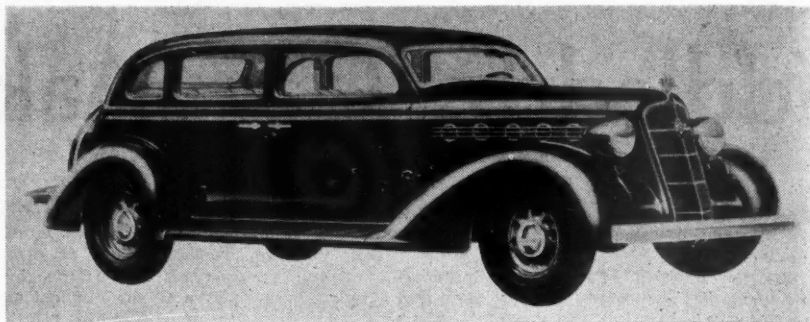
works in a factory or operates a factory has to be sold on the idea that level production is the most efficient thing for any kind of a plant.

"The automobile industry will always try to make the production curve as level as possible, does store parts and, in accordance with the resolution passed by the Manufacturers' Association on Dec. 11, will try to set forward the showing of new models, so as to avoid the strain of getting enough cars in the field to meet the spring business.

"The men in the factory alone, however, cannot level out the sales curve. When the public wants cars, we should build them and furnish the employment to the men. We cannot store many finished cars, and we must make changes so as to give the customers the benefit of progress made in the engineering departments, where we spend millions of dollars a year, practically all in labor skilled and technical.

"We hope that there will be no more reports of this nature—even preliminary—given to the public. We are all trying hard to help make general economic conditions better, and it is significant that within Detroit and surroundings, or in any district where automobiles are manufactured, the general economic conditions have improved faster than elsewhere.

"Spreading work too thin is, of course,



The Chrysler-Plymouth seven-passenger sedan on a wheelbase of 128 inches, with built-in trunk.

not constructive. We signed a code and agreed not to exceed 40 hours average, and every man with automobile experience knows that higher weekly hours must be worked in some seasons if he is to have any opportunity of approaching 40 hours average. To attempt to spread this thinner and load the price of it on the finished car would only mean that we would have less cars to make, less work, and less payroll."

"No Written Agreement Tending Toward Closed Shop," Fisher Replies to Union

Replying on Tuesday to demands made on its Cleveland plant manager, the Fisher Body Corp., in a statement signed by E. F. Fisher, general manager, has taken a position which it is believed will serve as a model in case representations are made by the A. F. of L. at other automobile plants.

Mr. Fisher declares unequivocally that "No written agreement has been or will be made at any time with any group tending toward a closed shop." He states that the committee of the union, since it represents only a minority in the plant, cannot enter into agreements for all employees, and that a substantial majority of workers indicated their lack of affiliation with any labor group in the recent primary election held by the Automobile Labor Board.

He also said that the question of a 30-hour week cannot be discussed because the action of Congress will determine the issue, and moreover, for any plant to have a 30-hour week and the remainder of the industry to have longer hours would be economically unsound and unfair. The demand for an increase of 66 2-3 per cent in the minimum wage rates was refused because hourly rates already are 7 per cent higher than in 1929 and 1935 wage scales are admittedly higher than are being paid for like work in the Cleveland district. The question of representation for collective bargaining is now being determined by elections under auspices of the Wolman Board, which also will settle the matter of pay for employee representatives. All matters such as seniority, discrimination and continuance of

employment are covered by rules laid down by the Wolman Board and administered by it.

Mr. Fisher remarked that: "Since the enactment of NIRA, the company has continuously bargained collectively and dealt freely and frankly with all employees or representatives chosen by employees. Conferences have been held with all represented groups. Many verbal agreements made as a result of these conferences have been conscientiously executed and will be in the future."

If a minority of employees continue to make unreasonable demands and to try to interfere with operations of the Cleveland plant, Mr. Fisher said that no other course will be open except to move much of the work done there now to other cities. In forthright language he declared: "The company wishes to point out that it cannot afford to have the production of its entire operations continuously jeopardized by unreasonable or wholly impossible demands being made periodically by minorities. Certain operations formerly performed in the Cleveland plant were moved to other locations this year partly because of labor difficulties. Continued agitation among an otherwise satisfied group of employees will eventually compel us to limit our Cleveland operations to what can be handled under such conditions."

The demands made on the Fisher plant by the A. F. of L. union were summarized in last week's issue, page 300.

At the ALB elections held last week at the Cleveland plant, to which Mr. Fisher refers, 3869 out of 5212 voting indicated no affiliation. The A. F. of L. polled 124; the MESA, 56; IWW, 3; the Fisher Body Employees' Cooperative Association, 487; blank, 375, and void, 298.

Recovery Costs Cut Chrysler '34 Profit

Earnings Are \$3,400,000 Below 1933 Total; Sales Gained 51% Over Year Ago

Higher costs incident to the recovery program cut Chrysler profits in 1934 to \$9,534,836, as compared with net earnings in 1933 of \$12,129,120, despite the fact that the corporation increased its sales over the previous year by 51 per cent to a total that was only \$12,778,829 less than the record volume attained in 1929. Earnings in the fourth quarter of last year amounted only to \$112,010. On a per share basis earnings were \$2.19 in 1934 against \$2.78 in 1935.

The report is summarized in the following table, the balance sheet items being as of Dec. 31:

	1934	1933
Sales	\$362,254,625	\$238,675,951
Units sold	598,884	451,734
Sales per unit	\$605	\$526
Net earnings	9,534,836	12,129,120
Cash and securities	32,415,843	37,369,976
Sight drafts	6,597,377	435,292
Receivables	10,541,684	2,277,681
Inventories	37,533,615	34,556,769
Total current assets	87,088,519	74,639,718
Total current liabilities	37,686,371	21,222,605
Funded debt	20,150,500	40,026,500
Stockholders' equity	85,823,165	81,849,781

Harold Gronseth Joins Chilton Staff

Harold E. Gronseth has been appointed Detroit news editor of Chilton Company and will represent *Automotive Industries*, *Automobile Trade Journal* and *Commercial Car Journal* editorially in that territory.

For several years past Mr. Gronseth has been in charge of the *Wall Street Journal's* news gathering organization in Detroit. In all, his connection with that newspaper extended over a period of twelve years, he having been a member of its editorial department in New York before going to Detroit.

Mr. Gronseth has had long experience in gathering and interpreting business news and enjoys a wide acquaintance among men active in the automotive industry.

Weirton Decision Jolts Legal Premise Of 7a, Wagner Labor and 30-Hr. Bills

In a decision which strikes at the very foundations of the legal theory of the labor provisions of NIRA and such proposed measures as the Wagner Labor Relations Bill, the 30-hr. Week Bill, etc., U. S. District Court Judge John P. Niels this week held Section 7a unconstitutional in denying the government's request for an injunction restraining the Weirton Steel Co. from interference with the collective bargaining activities of its employees.

The court held that manufacture is not interstate commerce and that the relations between employer and employee do not affect interstate commerce. The latter point is of particular importance since it is on the theory that labor relations, while not commerce in themselves, affect the free flow of interstate commerce and thus are subject to Congressional regulation under the commerce clause of the Constitution.

The decision also upheld the so-called company union, holding that the evidence did not support the government's contention that Section 7a had been violated in either its organization or its operations.

Reports from Washington indicate that the government plans to carry the case to the Supreme Court and that an attempt may be made to draft new legislation.

Packard Employees Assoc. Wins 12 Bargaining Berths

Ninety-eight per cent of Packard's employees voted in the final election conducted by the Wolman Board on Tuesday. Twelve of the 20 successful candidates were members of the Packard Employees Association and the remaining eight were unaffiliated. In primary elections held Tuesday at plants of Graham-Paige Motors Corp., all candidates selected were unaffiliated.

The Automobile Labor Board has announced that in elections held in 19 plants up to Feb. 22, 88 per cent of the 84,003 eligible voters went to the polls. Unaffiliated voters numbered 61,691, or 75 per cent of the total. Employees' associations drew the support of 8,908 workers, or 11 per cent, and the Associated Automobile Workers of America got 4102 votes, or 5 per cent. The A. F. of L. secured 3332 votes, or 4 per cent. The ALB has ruled that sticker candidates may run for election in a district if one of the two high nominees declines the nomination.

APEM Code Amendment Hearing Held at Capital

WASHINGTON, Feb. 27—Public hearing on the proposed revision in the definition of "industry" in the APEM was held here today with C. C. Carlton, president of the APEM, appearing as the first witness. C. O. Skinner, APEM executive secretary, presented the amendment. In his discussion

of it, he said that many code authorities have claimed representation of automotive parts makers and that they have demanded that such parts makers sever their connection with APEM and operate under some other code.

The proposed revision was attacked by numerous groups including the National Electrical Manufacturers Association, the Scientific Apparatus Code Authority, the Fabricated Metal Product and Metal Finishing Code Authority, the Non-Ferrous Foundry Industry, and others, all claiming that the amendment cut into their fields. The Wholesale Automotive Trade Code Authority protested the inclusion of "and/or sale" in the definition on the ground that it would permit manufacturers to wholesale without being subject to the control of the wholesale automotive code.

Joint MEMA, MEWA, NSPA Group to Guide ASI Show

In accordance with the practice in previous years, the 1935 Automotive Service Industries Show will again be under the three-way sponsorship of Motor and Equipment Wholesale Association, Motor and Equipment Manufacturers Association, and National Standard Parts Association. Each organization, however, has appointed its representatives to a joint operating committee which will have complete charge of rules, regulations and plans for the exhibition. Appointments to the J.O.C. have been divided equally between manufacturers and jobbers as follows:

For MEMA—J. M. Spangler, National Carbon Co., Inc., chairman; G. W. Sherin, duPont; C. P. Brewster, K-D Mfg. Co.

For MEWA—W. R. Crow, Crow-Burlingame Co.; F. P. Gaul, Gaul, Derr & Shearer Co.; E. S. Arnold, Onondaga Auto Supply Co.

For NSPA—W. H. Richardson, Timken

Roller Bearing Service & Sales Co.; L. G. Matthews, Sealed Power Corp.; H. A. Lightner, DeLuxe Products Corp.; J. Fischer, Auto Parts & Gear Co.; W. B. Carroll, Syracuse Auto Parts, Inc.; F. P. Rudy.

The first meeting of the Joint Operating Committee will likely be held early in March, with announcement as to the time and place for the 1935 Show coming some time in April.

Ford Bid on U. S. Car, Truck Order Asked

Government Move Confirms Changed Attitude Toward Compliance Requirements

The change in the government's attitude toward bidders for government business whose bids were not accompanied by the required certificates of compliance was further confirmed this week when the War Department invited the Ford Motor Co. to bid on a fleet of 4910 cars and trucks to cost approximately \$4,000,000 for CCC use.

Contrary to previously published reports the government always has sent bids to the Ford company, but these have been rejected because they were returned without the necessary compliance certificates. The latest invitation to the Dearborn company went out with the certificates omitted, and it has been authoritatively stated that this move was made to bring about a peaceful settlement of the differences existing between the Ford organization and the government departments.

The recently issued War Department schedules carry, in place of the compliance certificates, the following clause: "No bid will be considered unless it contains or is accompanied by an appropriate certificate, executed by the bidder, complying with the provisions of the Executive Order of March 14, 1934 (No. 6646) and regulations and instructions issued pursuant thereto." Meanwhile NRA officials are arranging with the office of Comptroller General McCarl for a modified interpretation of the President's order requiring the certificates of compliance from government bidders.



A streamlined Maybach car exhibited in the Berlin show, said to be capable of a speed exceeding 100 m.p.h.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

There was a slackening in some branches of industrial activity last week, but general business continued to register gains. Steel operations declined for the second consecutive week. The output of coal increased to a new high level, and there was a further expansion in lumber production.

Business Index Rises

The Guaranty Trust Company's index of business activity for January stood at the preliminary figure of 71.5, as against 68.2 for December and 65.5 for January, 1934. The company's index of wholesale commodity prices on Feb. 15 was 53.1, as compared with 52.8 a month earlier and 54.7 a year earlier.

Car Loadings Irregular

Railway freight loadings during the week ended Feb. 16 totaled 581,981 cars, which marks a decrease of 10,579 cars below those during the preceding week, a decrease of 18,287 cars below those in the corresponding period last year, and an increase of 64,452 cars above those in the corresponding period two years ago.

Life Underwriting Advances

Sales of ordinary life insurance in the United States during January were 37 per cent above those in the corresponding period last year. For the twelve months ended January, 1935, sales were 13 per cent above those in the preceding twelve-month period.

Food Prices Move Up

Retail food prices during the two weeks ended Jan. 29 advanced 1.1 per cent, according to the Bureau of Labor Statistics. The current average is the

highest since May, 1931. The largest increase was in the meat group, which advanced 2.3 per cent.

More Current Produced

Production of electricity by the electric light and power industry in the United States during the week ended Feb. 16 was 7.3 per cent above that in the corresponding period last year.

Building Contracts Lag

Construction contracts awarded in 37 eastern states during January were 8 per cent above those during the preceding month, but were 47 per cent below those in January, 1934. However, building financed by public funds reached its peak a year ago.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended February 23 stood at 82.2, as against 82.4 for the week before and 81.7 for two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended February 20 showed a decrease of \$1,000,000 in holdings of discounted bills. Holdings of bills bought in the open market and of government securities remained unchanged.

Ford still leads with 409 registrations, this is a loss of 44 from their total of 453 for January of last year. Plymouth and Dodge moved into second and third places respectively with 244 for Plymouth and 240 for Dodge. The only GM product to register a gain was Chevrolet which moved into fourth place with 213 registrations against 182 for the corresponding period of 1934.

Automotive Retail Sales Increased 22% in 1934

The increase in automotive retail sales for 1934 led all other merchandise divisions for the year, according to the Department of Commerce, with the exception of the mail order houses. For the 12 months of last year retail automotive sales recorded a gain of 22 per cent over the volume of business done in 1933.

The general retail sales, embracing all divisions, for 1934 were 14 per cent greater than the previous year, and total sales in 1934 had recovered to a point where they were 58 per cent of the 1929 total.

Jan. New Car Financing Gains 85% Over Year Ago

Preliminary estimates of the dollar volume of retail financing of new passenger cars by the Department of Commerce indicates that the volume of business for January of this year increased 85 per cent over the corresponding month of 1934. Compared with January, 1933, the gain was 88 per cent, and the increase over December was 41 per cent.

Lubriplate Mfg., Sales Rights Go to Fiske Bros.

Fiske Brothers Refining Co., 24 State street, New York City, has acquired the exclusive manufacturing and sales' rights of Lubriplate lubricants.

The Lubriplate division will be under the direction of Robert L. Watts, who has been identified with Lubriplate since its introduction in this country. R. L. Gardner who also has been identified with lubriplate for several years is joining the division.

John C. Kerrison

John C. Kerrison, automobile editor of the *Boston Post*, died last week at his home in Winchester, Mass., and was buried at Portland, Me. Associated with the newspaper world for 50 years, Mr. Kerrison wrote automotive news for more than 30 of those years during which he covered the early races at Ormond Beach, every race held at the Indianapolis Speedway, the Vanderbilt road races on Long Island, the Glidden tours and the Climb to the Clouds up Mt. Washington. For many years he was an AAA official, acting as judge, starter or timer in many events.

Dodge Employing 25,000 Workers

The present active payroll of the Dodge Brothers Corp. now carries the names of more than 25,000 workers, according to factory officials.

Canadian Employment Up 40% at GM Plants

Chrysler January Sales to Dealers Double 1934; Ford Leads Ont. Registry

Employment increases since the first of the year at General Motors plants in Canada range from 24 per cent to 48 per cent over the corresponding period of last year, according to R. S. McLaughlin, president of General Motors of Canada, Ltd. This represents a general average gain of 40 per cent. Increased employment at the Oshawa, Ont., plant on the first of February was 45 per cent above that for the same time in 1934; the St. Catharines, Ont., plant is employing 24 per cent more workers, while at the Walkerville, Ont.,

plant 48 per cent more workers were employed. The total number of employees on the payroll of the Canadian company at the close of last month was 6000.

Chrysler Sales Doubled

January shipments to dealers by the Chrysler Corp. of Canada, Ltd., more than doubled the number shipped during the corresponding month of 1934, according to corporation officials. Sales to dealers during the first 15 days of February were 15 per cent ahead of the number for the same period of last year.

New Car Registrations

January new passenger car registrations in the Province of Ontario totaled 1418 against 956 for the same month last year, a gain of approximately 50 per cent. While

Motor Demands High As Steel Output Lags

**Second Quarter Prices
Leave Market Structure
Unchanged; Buy Equipment**

With the filing of second-quarter prices definitely leaving the steel market's price structure unchanged, and steel rollers and finishers confident that automotive consumption will be well maintained over the next two months, the market has become more or less of a routine affair.

A further slight recession in this week's rate of primary operations, the American Iron and Steel Institute reporting 47.9 per cent of capacity engaged as compared with 49.1 per cent in the preceding week, is not reflected in the operating rate of finishing mills

One of the fleet of Airflow tank trucks built by Dodge Brothers for Standard Oil of N. J. and Cal. The vehicles were constructed to the users' own specifications.



catering to automotive consumers. Many of these are working to the limit of their mechanical capacity and man-power. In fact the inability of finishing mills to speed up shipments beyond the present

rate is held responsible for the relative backwardness of automotive commitments for steel bars and kindred descriptions of steel.

Detroit, Cleveland and Youngstown district mills are operating at unchanged high rates; Buffalo district sheet mills also are being operated under pressure from automotive consumers for deliveries. Wire mills have been able to step up, in some case to double their operating rates, as the result of the demand for wheels and upholstery springs. Automotive alloy steels, especially nickel-chromium alloy steels, are moving into assemblies at a rising rate.

More and more orders for new strip-sheet rolling equipment are being placed by steel producers, eager as they all are for as large a slice as possible of the available automotive business. In fact, the entire steel industry is being more and more slanted in the direction of automotive requirements, which today, more than ever, constitute the backbone of the actual and potential market.

Pig Iron—Prices filed by producers with the Code Authority show that first quarter levels will be continued during the second quarter. Automotive foundries are taking in iron as they need it, but their orders were largely responsible for the fact that in January 24 idle furnaces went into blast, the largest increase in units in production in more than two years.

Aluminum—An amendment to the aluminum industry's code, which has again been extended to April 6, calls for confidential reports to NRA of all sales of domestic and imported virgin metal with the price obtained in each transaction. A slight rearrangement of prices for secondary alloys leaves the market virtually unchanged.

Copper—While the "Blue Eagle" price remains at 9 cents, declines abroad caused the "outside" market to dip to 7½ cents, delivered Connecticut.

Tin—A sharp break in London, ascribed to inability of the International Tin Pool to maintain control, resulted in spot Straits tin being offered at the beginning of the week at 48¼ cents, the lowest price since October, 1935.

Sloan Outlines Reactions to First Meetings with GM Dealer Councils

In a frank discussion of the initial meetings with each of the four dealer councils recently organized by General Motors, President Sloan told a recent GMAC convention that he felt that a wonderful means had been provided for getting essentials directly before the corporation's policy group on distribution.

Apparently the members of the councils caught the spirit of the thing and expressed themselves frankly and freely for Mr. Sloan said the biggest question on their minds was their profit position and that they were very intent on knowing what the corporation was going to do about it.

The members also made it clear, Mr. Sloan indicated, that one intelligent and essential way of improving the dealer's position was for the manufacturer to be more scientific in the appointment of dealers. This viewpoint apparently paralleled Mr. Sloan's own thinking because in his remarks to the GMAC meeting he said I "have felt for a long time past that one of the contributing causes, if not a most important element in the lack of security of many of our dealers, is the fact that we have had in the past not only no intelligent policy with respect to appointing dealers in multiple dealer cities, but whatever policy may have been determined upon by our various divisions has been changed so often that nobody knows what the real policy is."

Continuing his discussion of this point, Mr. Sloan expressed the view that the problem could not be solved by the adoption of general rules. Instead, he said, dealer contacts must be developed "with respect to

individual requirements or necessities or independent valuations of each community so far as its potential or other characteristics are concerned. . . ." To meet this situation, Mr. Sloan said that plans were already under way to develop "a more intelligent method of determining how we should act in these communities through our operating divisions. I propose to have that checked from an auditing standpoint and corresponding activities in the corporation itself, so that the enthusiasm which must immediately prevail, and the objection that if they are going to do business on a bigger scale they need more dealers, which frequently is the cause of our difficulty, can be tempered with a more judicial attitude."

So far as the dealers' code is concerned, Mr. Sloan said, "I feel we are at the forks of the road. There is no mistaking that that is the case; unless, of course, something is done to maintain the code—and when I speak of the code I am talking primarily with respect to control of used car prices. If that is not possible . . . certainly we must face what seems to me a very difficult situation, if we are going to judge that possibility from the records of the past. . . . I may say further that it was the opinion of the councils that a reasonable amount, or practical amount, let's say, of compliance was not practical without the support of the manufacturer, which, of course, involves a very difficult question."

In connection with the points brought up at council meetings, Mr. Sloan revealed that careful notes were made of all of the issues raised, and that he would report on all such points at subsequent meetings. At that time, the corporation will make a frank statement of what it proposes to do on each point or, if nothing can be done now, to set the point forward for consideration at a definite date in the future.

D. E. Anderson Abroad

David E. Anderson, chief engineer of the Bohm Aluminum & Brass Corp., is in Europe for a stay of several weeks studying engine design, particularly as related to combustion chamber and cylinder head practice. Mr. Anderson's trip will carry him to every country abroad where there are automobile or engine manufacturers of any prominence.



N.S.P.A. board of directors as they appeared at their recent Detroit session

NSPA to Maintain Jobber In Competitive Position

The Manufacturer Board of Governors of the National Standard Parts Association has gone on record as subscribing to the principle that N.S.P.A. jobber members be maintained in a position to buy on terms which will permit them to remain competitive with others buying for resale.

This statement was issued by the N.S.P.A. following a recent four-day series of committee and board meetings in Detroit, attended by jobbers and manufacturers representing all sections of the country.

These representatives of N.S.P.A.'s two divisions devoted a major portion of their meetings to consideration of plans for new activities aimed at furthering the interests of the automotive jobber.

As a result of a lengthy discussion by the association's Marketing Research Committee of increasing competition from other channels of distribution, it was instructed that a study of the cooperative advertising campaigns of other industries be surveyed for the purpose of securing information as to the methods which have been responsible either for their success or failure.

While details have not been released, N.S.P.A. headquarters advises that under the supervision of the association's Marketing Research Committee, plans are in course of preparation for a merchandising activity directly aimed at a new and closer tie-up between wholesalers and their repairmen customers.

Turn-over of jobbers' lines is another subject that came in for considerable discussion which was concluded with the decision that a survey of N.S.P.A. jobbers be made to determine the turn-over that they are securing on their leading lines; report of the survey to be made to both manufacturer and jobber members.

Myers Strikers Reject Labor Board Proposal

Striking workers at the Myers Regulator Co. in Toledo have turned down a tentative settlement agreement proposed by the Regional Labor Board. The Board had worked for two days on mediation efforts which resulted in the rejected agreement. Through the Board the company is said to have offered competitive wage rates.

A threatened strike at the Mather Spring Co., arising from the layoff of 180 men com-

posing the night shift was averted when the company agreed to reinstate the workers within the next week or 10 days after assurances were received that no changes in spring styles is contemplated. The company is reported to also have agreed to work out seniority rights.

Ward Day Morton

Ward Day Morton, in charge of the Packard Motor Car Co. salesroom at Miami Beach, Fla., during the winter season, was killed last week when his car overturned and pinned him beneath the wreckage. Mr. Morton, who was 45 years old, was a well-known racing driver and formerly had been sales manager for the Cord car. As a racer he drove under the name of Wade Morton.

Belgian Trade Pact Clips 15% From U.S. Car Duties

The American-Belgian reciprocal trade agreement signed Wednesday provides for a cut of 15 per cent in the Belgian duty on American passenger cars. The cuts in duties on automobile parts range from 64 to 80 per cent and affect 11 classifications. Taking into account 14 classifications of parts on which no duty decreases were made the average reduction is 50 per cent. The weight classifications for duty purposes were left unchanged except for consolidation of the two lowest brackets.

The agreement will become effective 30 days after proclamation by the President and simultaneous official publication in Belgium expected to be made in two or three weeks.

Robert C. Graham, chairman, export committee, Automobile Manufacturers Association and vice-president, Graham-Paige Motor Corporation, in a statement said the motor industries believe the signing of the agreement represents another forward step in the sound development of our foreign trade.

Schon to Discuss Trucks at Chicago SAE Meeting

Pierre Schon, transportation engineer for General Motors Truck Co., will discuss "Economical Operation of Motor Trucks" at the spring meeting of the Chicago section of the S.A.E.

Dealer Code Amendment Fixes Top Allowance 15% Under Fair Sales Value

Top allowances on used cars will be 15 per cent less than the prevailing fair sales values of better grade motor vehicles, if NRA approves an amendment to the Motor Vehicle Retailing Code submitted by the dealers' code authority. A hearing on the proposal will be held at the Washington Hotel, Washington, on March 7.

The amendment, which applies to cars and trucks up to $\frac{3}{4}$ -ton capacity, vests broad discretionary powers in the determination of the "fair sales value" in the National Automobile Dealers' Association, subject to the approval of NRA. The present formula for averaging used car sales reports after elimination of the low 20 per cent is discarded and instead the fair sales value is defined as a value reasonably related to the average price the public is paying for the better grade of the particular model or class of used vehicle. Under this definition, obviously, the values set will depend largely on the administrative interpretation.

The amendment requires the NADA to compile used car sales reports within the same or comparable trading areas, such reports to be supported by sworn statements. These reports are to cover the preceding 30 days approximately and, to insure that

sales values determined are representative only of the better grade of vehicles, only reports of sales of better grade vehicles are to be used in arriving at the fair sales values. Evidently the determination of which reports cover better grade vehicles and which are for jallopis, is up to the NADA. The final fair sales value must be in reasonable relation to the fair sales value of the majority of better grade vehicles reported on.

Where data is insufficient to determine the fair sales value in the manner just outlined, the value is to be determined on the basis of actual sales and other available information. Values so determined are to be sent from time to time to 10 per cent of the dealers in each guide book area handling the particular makes of cars and their comments are to be considered in the final determination.

The 15 per cent deduction from the fair sales value, establishing the top allowance price, applies to all used vehicles except on current yearly models on which no book price has been established. On these, dealers may allow up to the new delivered price. Dealers would be required to forward reports of all used car sales as made and to authenticate them monthly with sworn statements. NRA is required to certify copies of each edition of the guide book.

Profit-Loss Statements of Automotive Companies

The annual profit and loss statements of several automotive firms are reported in the following table:

	1934	1933
Ainsworth Mfg. Corp.	+ \$564,237	+ \$105,363
Federal Mogul Corp.	+ 102,028	+ 61,606
Hall Lamp Co....	+ 80,694	+ 21,341
Fedders Mfg. Co..	+ 88,503	+ 214,664
Bohn Aluminum & Brass	+1,518,387	+1,494,552
Midland Steel Products	+ 680,656	+ 672,728
Campbell, Wyant & Cannon	+1,392,550	+1,488,929
Evans Products ..	+1,323,840	+ 297,126
Russell Motor Car Co.	+ 65,534	+ 37,372

Dodge Delivering 5000 Trucks to U.S. Army Posts

Dodge Brothers are now delivering more than 5000 trucks of various types to army posts in all parts of the country, according to J. D. Burke, director of truck sales for the corporation. The trucks have a total value of approximately \$4,500,000.

The order, resulting from 10 contract awards by the government, includes four-door sedans, 1/2-ton reconnaissance trucks, 1/2-ton panels and varied types of 1 1/2-ton vehicles; the largest single item is 2984 1 1/2-ton cargo trucks. Many of the trucks are of the four-wheel drive type.

Chicago Yellow Cab Co. Asks Bids on 1000 Cars

The Yellow Cab Co. of Chicago, according to Thomas B. Hogan, president, will soon let contracts for 1000 taxicabs at an estimated cost of more than \$1,000,000. Bids are being received now, it is reported, and the cabs, the first to be purchased by the company since 1931, are to be placed in service July 1.

2 Mos. Output Up 58%

(Continued from page 307)

how many used cars the retail market can absorb, however remains to be determined.

Ford is leading the industry in output with 160,000 units projected for March in the U. S. alone. This will necessitate a daily rate of more than 6000 cars and trucks.

Plymouth's retail deliveries during the week ended Feb. 23 totaled 6951 units, an increase of 3.6 per cent over the preceding week and of 40.7 per cent over the same week last year. Plymouth dealers delivered to customers 46,449 cars from Jan. 1 to Feb. 23, as against 23,171 cars in the comparable period a year ago, an improvement of 100 per cent.

Pontiac last week assembled 3826 cars in five days and in the preceding week built 3504 cars. It is understood to have come close to its February goal of 15,000 cars. Pontiac retail deliveries in the U. S. for the first 20 days of February were 6957 compared with 3429 for the same period last year and 4039 for the first 20 days of January this year.

Oldsmobile broke all previous monthly records in February turning out over 14,000 cars and surpassing the high mark set in April, 1929. On Feb. 25, Olds

manufactured 852 cars for an all-time record. In the first 20 days of last month Olds sold at retail 6943 cars, compared with 6242 cars in the entire month of February, 1929, previously the best February in the company's history.

DeSoto has recorded gains in each of the last eight weeks during which a total of 2455 units have been sold by dealers, an increase of 542.7 per cent over the same weeks of 1934.

Chrysler and Plymouth retail deliveries by Chrysler dealers for the week ending Feb. 16 totaled 2624 Plymouths and 580 Chryslers for a grand total of 3204 units. In seven weeks of this year Chrysler dealers have delivered 14,735 Plymouths and 2951 Chryslers for a combined total of 17,686 units.

Demand for new Buicks for the first 10 days of February was 28 per cent ahead of the corresponding period of last year, according to W. F. Hufstader, Buick general sales manager. Compared with the first 10 days of the preceding month the first 10 days of February showed an increase of 33.4 per cent in retail deliveries.

Dodge dealers' retail deliveries so far this year total 27,751 passenger cars and 5155 trucks, a total of 32,906 sales as against 17,615 units delivered during the corresponding period of 1934, a gain in year-to-date deliveries of 86.8 per cent.

The Department of Commerce estimates the retail sales value of new passenger cars for January of this year to be almost double that for the same month of 1934. The daily average sales gain over December was almost 96 per cent compared with the usual increase of about 21 per cent.

R. L. Polk & Co. reports an increase of 134.88 per cent in January sales of new cars in 27 states over the same month of last year. These 27 states represent almost half the entire United States. Truck registrations in 26 states gained 58.64 per cent over the corresponding month of last year, Polk reports.

Plymouth "High Wheelers" Continued for Rural Roads

Plymouth Motor Corp. is adding two models to its line, a business coupe listing at \$510 and a two-door sedan at \$535. The cars are designed to meet demand from business organizations for lower priced transportation. The company also announces a special "high-wheel" Plymouth car with 20-in. steel disc wheels, affording unusual road clearance for rural districts. This is the third year that Plymouth has offered a high-wheel model. The new cars incorporate the same major features as other models in the Plymouth line.

Hupp Drops Price \$100 on Models of 521 Line

Deluxe models of the Hupp 518, 521 and 527 series are now available. The 518 deluxe sedan lists at \$835. All models of the 521 line list at \$1095 which represents reductions of \$100 on the coupe and victoria models. The 521 deluxe models all list at \$1170. Similarly all models of the deluxe 527 series carry the same list price, \$1445, which is \$50 above the list on the 527 standard jobs.

Stout, Warner to Visit Western SAE Sections

William B. Stout, president, and John A. C. Warner, secretary and general manager of the Society of Automotive Engineers, expect to leave New York early next week for a visit of several weeks to SAE sections in the middle west and Pacific Coast.

The first SAE meeting these officials will attend will be in Kansas City, on March 18. From there they will go to Denver to meet the SAE section of that city, and later on will visit SAE sections in Los Angeles, San Francisco, Portland and Seattle.

Studebaker Branch Closed in N.Y.; Name Distributors

Studebaker has closed its factory branch in the New York metropolitan area and appointed in its place six distributors and dealers. The newly appointed distributors and dealers were entertained at dinner in the Park Central Hotel recently to become acquainted and celebrate the eighty-third anniversary of the founding of the Studebaker company. Paul G. Hoffman, president of the Studebaker Sales Corp., was the principal speaker. C. K. Whitaker, regional manager, presided at the dinner meeting.

Strike Threat Fades

(Continued from page 307)

not wavered from its earlier program of having some local unions present demands to individual plants.

Keen observers in the industry believe that union plans are not progressing so well as anticipated, partly because of lack of leadership; that is, union officials have allowed the situation to get out of hand and as a result there is indecision as to what the future program should be. This development further reduces the possibilities of widespread strikes.

CALENDAR OF COMING EVENTS

SHOWS

- Minneapolis Automobile Show....Mar. 9-16
- Mankato, Minn., Automobile Show
Mar. 16-23
- Machine Tool Exposition—Cleveland
Sept. 10-21
- 5th Annual Automotive Maintenance
Meeting, PhiladelphiaMarch 5-8

CONVENTIONS AND MEETINGS

- U. S. Chamber of Commerce Annual
Meeting, Washington, D. C.
Apr. 29-May 2
- Lafayette, Ind. (Purdue University),
Automotive Service Conference,
Mar. 21-22
- National Battery Manufacturers Assoc.
Spring Convention, Cleveland, May 22-23
- S.A.E. Summer Meeting—White Sulphur
Springs, Va.June 16-20
- American Society for Testing Metals,
DetroitJune 24-28

Future Flexibility and in Production Set-up for

by Joseph Geschelin

Engineering Editor, Automotive Industries



Fig. 1—Rough and finish broaching of bearing seats on an Oilgear surface broaching machine. Note detail of the broach.

WHEN plans were laid last year for building a new six-cylinder model, the Pontiac Motor Co. drew upon its wealth of manufacturing experience to develop a work routing consistent with anticipated volume. This, in combination with a happy choice of machine tool equipment, has resulted in a layout which, to us, seems to embody the very essence of flexibility.

As will be seen from illustrations given here, practically every machine on the floor is so designed as to permit complete retooling for improvements or model changes without entailing much additional expense. In fact, even radical changes can be made simply by supplying new fixtures and tool heads.

In this article we shall cover briefly the major operations along the cylinder block line, with just a glimpse of the crankshaft department. The production routing which is found in a later section has been condensed to encompass only the machining steps, omitting the many vital inspection operations, repairs, subassembly and the like, running into a grand total of 59 separate handlings, many of which en-

Fig. 2—Special three-way Natco used to drill four oil leads to crank bearings; also to drill oil connection holes in one setting.



tail a multiplicity of combined operations.

Receiving inspection is the first step preceding machining and it includes the essential checks for thickness of cylinder walls, clearances, and general adherence to established dimensions. The block is then washed and its interior surfaces painted to prevent corrosion.

After milling the top and bottom faces, two locating holes are drilled, reamed and countersunk in the pan rail to serve as the locating points on the fixtures for all subsequent machining operations.

Fig. 1 gives ample evidence of the progressiveness of Pontiac factory executives in adopting surface broaching for an operation which is fast becoming universal in the automobile industry. Here is an Oilgear, hydraulically operated surface broaching machine for roughing and finishing the main bearing seats in one pass of the broach. This view shows an excellent detail of the broach, the work being mounted in a massive fixture at the left, clamped in place by air cylinders.

Since cylinder finish is one of the most important elements to be considered in modern high-output engines, no

Present Economy Combined New Pontiac Six Engine

effort has been spared on the Pontiac Six to assure the best finish that the art affords today. Cylinders are rough-bored, 3.285-3.295; semi-reamed, 3.358-3.360; and finish-reamed, 3.373-3.735. Mirror finish then is produced by a double-honing operation at the tail end of the machining operations. This is done in two steps on two different honing machines using Micromatic hones.

Fig. 2 shows the interesting tooling using two adjustable heads in combination with a special fixture, drilling four oil leads through the crank bearings, at the left; and drilling an oil connection hole on the opposite side. Note particularly the unit drive construction in which the tool head and driving element are interchangeable and replaceable parts.

One of a battery of six, three-way, multiple spindle drilling and tapping machines is shown in Fig. 3. This is a 63-spindle machine for tapping all holes in the bottom and sides of the block with an automatic cycle.

Perhaps one of the most imposing machines in this department is the tunnel type boring mill, by Natco, Fig. 4, which completes five different operations on each of two blocks, so that two blocks are finished completely in each cycle. The first station is the loading of two blocks—second station left-hand head, core drill front cam and crank holes and end mill water

pump pad; right-hand head, core drill rear cam and crank holes, counterbore rear cam bearing, core drill and counterbore plug holes—third station, left-hand head, core drill front center cam and crank bearing holes; right-hand head, core drill rear center cam and crank holes—fourth station, rough bore cam and crank holes—fifth station, semi-finish bore cam and crank holes—

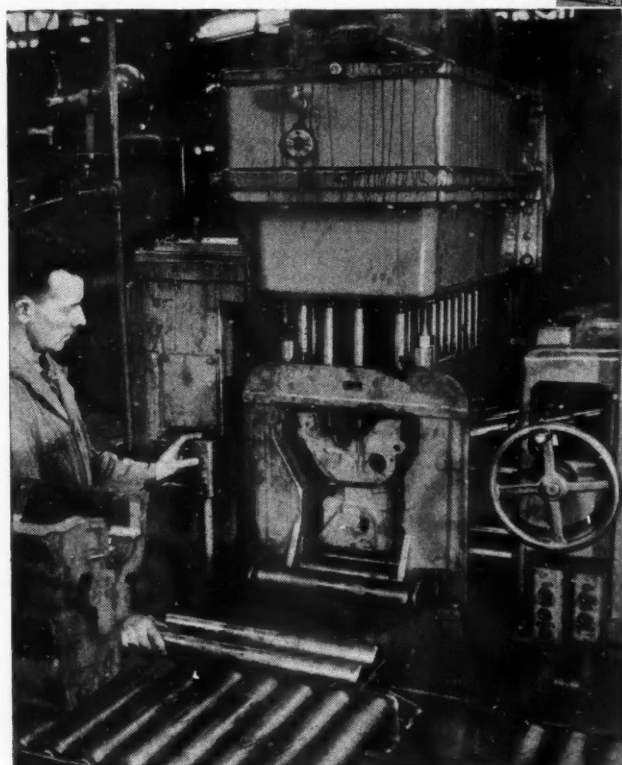


Fig. 3 — Tapping 63 holes in bottom and sides on a special three-way Natco.

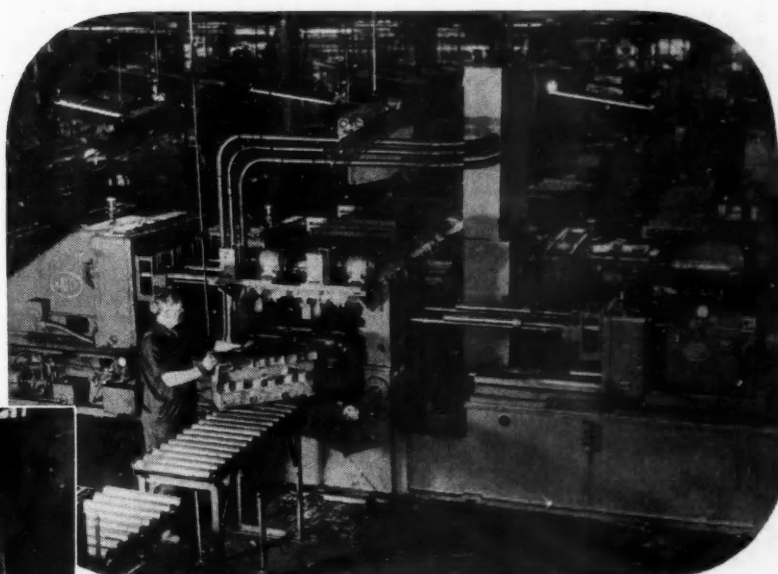


Fig. 4—Huge tunnel type Natco boring machine used to rough and finish all cam and crank holes. It performs five sets of operations on each of two blocks, completing two blocks in each cycle.

sixth station, chamfer both sides of center main bearing and one side of cam bearings.

Two rotary head Ingersoll mills are used along the line. One has two milling cutters for rough and finish-milling the clutch housing seat; the other has a single cutter for milling the oil slinger groove in the rear bearing. The latter is shown in Fig. 5. In each case the cutter or cutters are mounted in a rotary head, turning the cutter in a true circular path.

Another of the big machines is found in Fig. 6, which shows a special drum-type Natco used for rough and semi-

finish of oil pump and distributor holes and pads. The fixture accommodates five blocks at a time, the cycle proceeding through five stations. As you will note, the blocks are inclined in the drum fixture at an angle normal to the drilling heads at the left; drilling heads for the opposite side will be seen at the right. The cycle of events is as follows: first station, load—second station, drill four oil pump and distributor holes—third station, drill two holes, chamfer two holes, counterbore distributor hole—fourth station, tap two holes in oil pump pad and two holes in distributor pad—fifth station, ream and face oil pump hole and ream distributor hole.

This machine, too, while serving as a single-purpose machine on this operation can be readily changed over to another type of block by changing the drum fixture and the tool heads on both sides.

Fig. 7 shows a Natco with a special cycle and tooling for automatically chamfering the top and bottom of the cylinder bores. The cutters which may be seen at the top end of the boring teels chamfer the top surface; retractable cutters, shown partly at the lower end of the bar, take care of the bottom chamfer. These cutters come into play during a dwell in the upward stroke

of the boring head, the entire cycle of events being very fast.

A double-end Baker boring machine is shown in Fig. 8, set up for the semi-finish reaming of valve guide and tappet holes, holding them to a total tolerance of 0.005 in. An interesting detail at this machine, and one which is used frequently at other points, is the special turntable roll-over fixture to facilitate handling. It is used to transfer the block from the roller conveyor to the fixture and at the same time to turn the block over for the next operation.

In rough honing, the bore is checked with a Model H Federal cylinder gage for 3.375-in. diameter. At the finish honing operation, the bore is checked with a Zeiss internal indicating "Passimeter." All cylinder bores are checked at a final inspection station with a Zeiss Passimeter for diameter; also with a magnetic wall thickness gage.

From this point the blocks go to the water test fixture, then the valve guides are pressed in on an Oilgear press. Some of the other intermediate operations will be found in the routing which follows:

Brief Summary of Major Operations on Cylinder Block Line

(Total of all Stations, 59)

Mill top and bottom faces.

Drill, ream, and countersink two locating holes in pan rail.

Rough and finish broach bearing seats—Fig. 1.

Rough mill oil pump, distributor, fuel pump, and generator pads.

Rough bore cylinder bores.

Mill bearing locating slots.

Drill oil gallery holes.

Combination drill, centerbore and ream breather holes, etc.

Drill four oil leads through crank bearings—Fig. 2.

Drill bottom, water jacket and manifold sides.

Countersink drill and ream bottom, etc.

Tap bottom and two sides—Fig. 3.

Mill both ends.

Core drill and spot face 12 valve ports and seats.

Drill 12 valve guide and tappet holes.

(Turn to page 320, please)

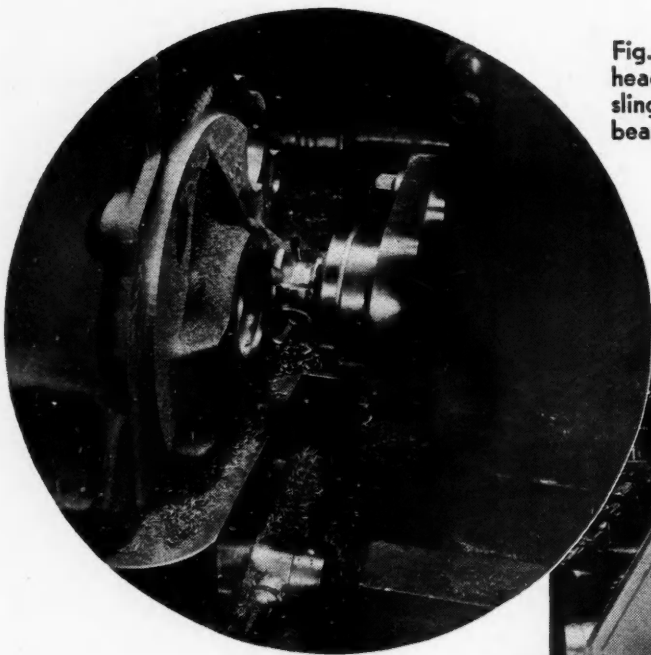
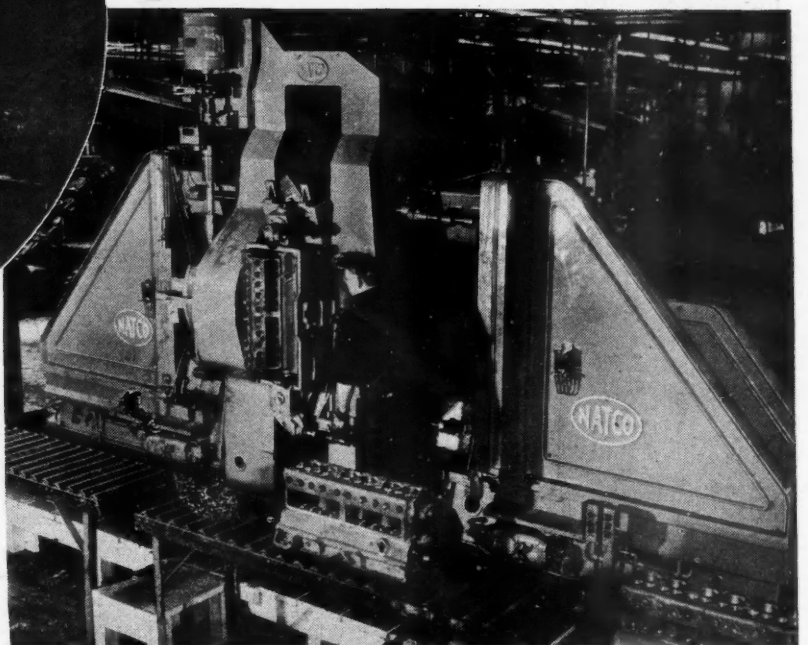


Fig. 5—Ingersoll rotary head mill forming the oil slinger groove in the rear bearing with a single milling cutter.



Another of the real big machines in the Pontiac line. This is a drum type Natco carrying five blocks in the fixture. It is used to rough and semi-finish oil pump and distributor holes and pads. Individual tool heads operate from both sides of the fixture.

Fig. 8—(Right) Double-end Baker boring mill, one of a battery in this line, semi-finish reaming valve guide and tappet holes. Note particularly the turntable roll-over fixture to facilitate handling by one man.

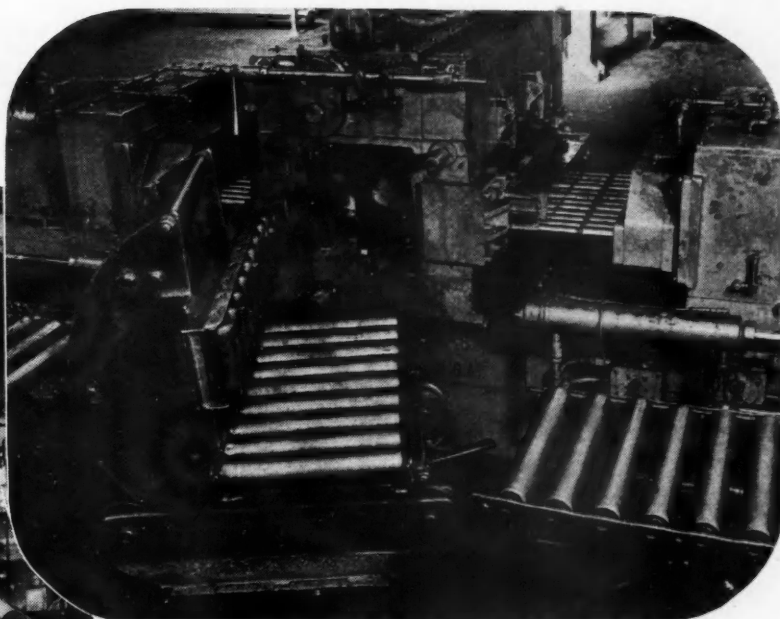


Fig. 7—(Left) Here is a vertical Natco with a special feed cycle for chamfering the top and bottom surfaces of the cylinder bores. The upper set of cutters handles the top chamfer while a single point retractable cutter at the bottom of each tool takes the bottom chamfer.

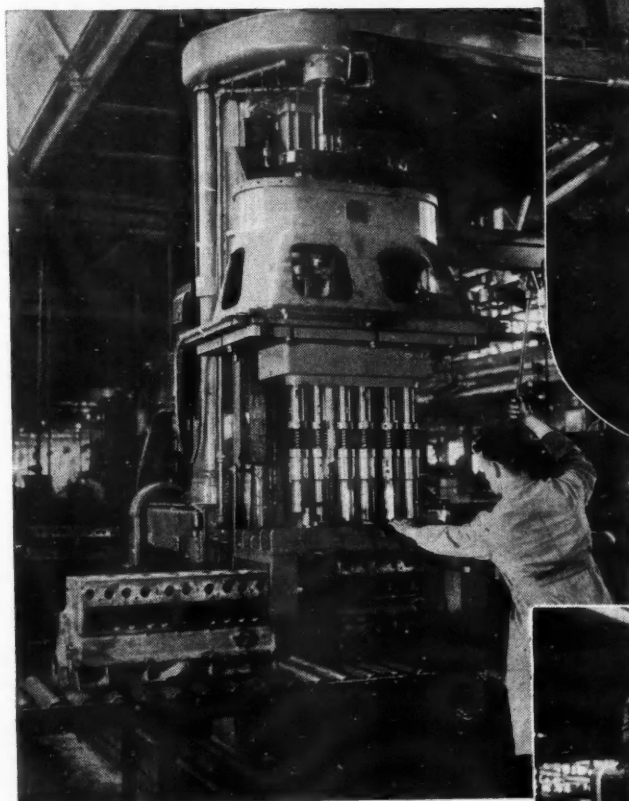


Fig. 10—(Right) This Natco drilling machine takes eight, six-cylinder crankshafts in one setting. It completes, in one cycle, all the drilling, tapping, counter-boring, and chamfering operations required at both ends of the crankshaft.

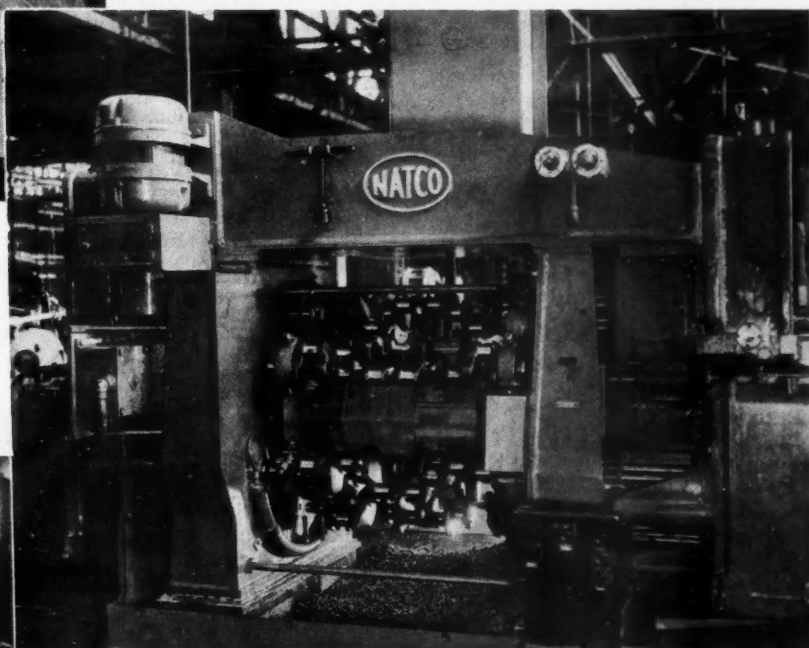
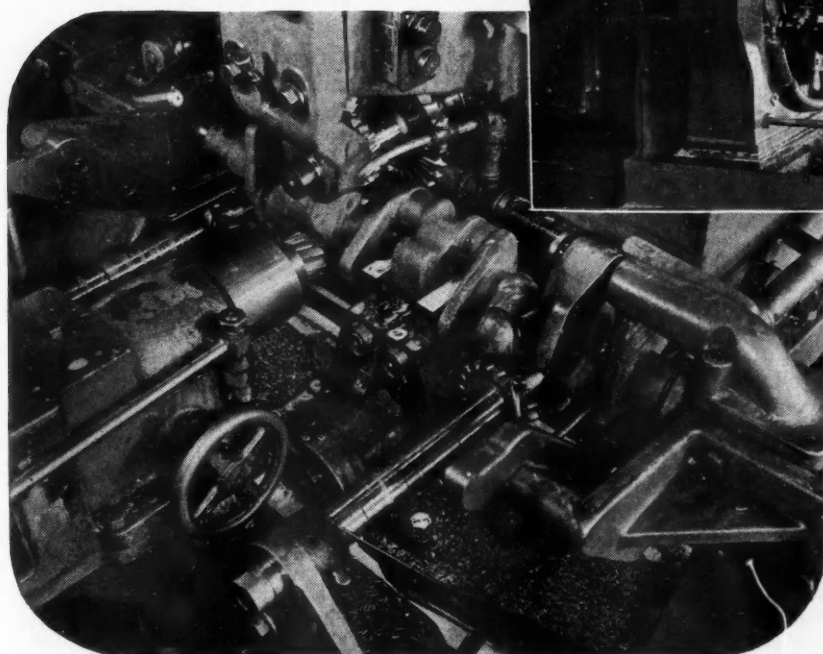


Fig. 9—(Left) DeVlieg Supermil busily engaged in cutting the driving lugs on numbers 1, 4, 5, and 8 cheeks to facilitate handling on the turning lathes. Eight cutters are in action—four at the center, two at the ends.



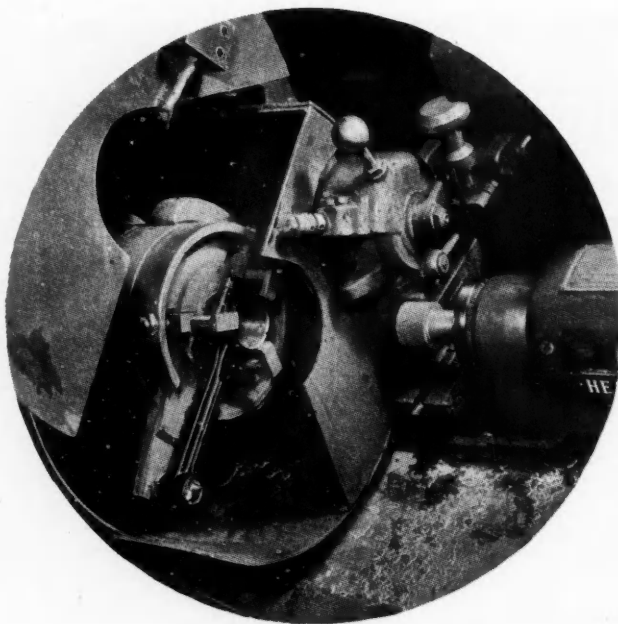


Fig. 11—Grinding the connecting rod big end hole on a Heald 72A internal grinding machine equipped with one of the new Red Head attachments.

Rough and finish mill clutch housing seat.
Tunnel boring machine finishing crank and cam bores—Fig. 4.
Mill oil slinger groove in rear bearing—Fig. 5.
Finish ream crank bearings.
Drill top, front and rear ends.
Drill, countersink and spot face, front and rear ends.
Tap top and both ends.
Rough and semi-finish oil pump and distributor holes—Fig. 6.
Semi-ream cylinder bores.
Chamfer top and bottom of cylinder bores—Fig. 7.

Semi-finish ream valve guide and tappet holes—Fig. 8.
Align ream valve guide and tappet holes.
Finish ream cylinder bores.
Rough hone cylinder bores.
Finish hone cylinder bores.
Water test.
Press in exhaust and intake guides.
Ream valve guide bushings.

Inasmuch as the Pontiac crankshaft department deserves separate treatment, we have selected just two of the outstanding operations for the purpose of this article. Fig. 9 shows a DeVlieg

Supermil, whose function is to mill in one setting the crankshaft lathe driving lugs on the number one, four, five and eight cheeks. Fig. 9 clearly shows the eight milling cutters that do the job—four in the center, two at each end.

The ends of the crankshaft are finished completely in one setting in the double-end, semi-automatic Natco drill shown in Fig. 10. It takes eight shafts at a time in the drum-type fixture. It drills, chamfers and taps at the hole in the front end; it handles 10 operations at the flange end, including the drilling, reaming and tapping of six flange holes.

Readers of *Automotive Industries* will recall the article we published recently describing the unusual set-up at Pontiac for the finishing and balancing of connecting-rod assemblies within 1/12 of an ounce. We have included here a photograph of the grinding of the big end on a Heald 72A internal grinder using one of the new Red Head attachments. See Fig. 11.

Although the foregoing is but a sketchy treatment of this important production line, it does serve to bring out some of the advances in the production art that have occasioned so much discussion in recent months. To us, it seems that the biggest achievement at Pontiac is the studied attention that has been given to the details of flexibility, both in the routing and in the selection of machine tools.

There is little or nothing in this layout to hamper the engineering department in its constant efforts at improvement.

Ninth Edition of Chilton Flat Rate Manual

In keeping with its previous quality presentations, the Book Department of the CHILTON COMPANY is now introducing the Ninth Edition FLAT RATE MANUAL.

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Profit Motive Must Be Preserved

by Hon. Daniel C. Roper

Secretary of Commerce

Written Specially for Chilton Publications



FROM time to time we have heard expressions that the Roosevelt Administration is opposed to business profits. This is far from true. The President himself has frankly and emphatically stated his belief in the profit motive as a fundamental incentive to work and economic achievement. Thrift is as essential to our social well-being today as it has ever been and thrift means profits.

The role of the Federal Government is to promulgate such methods and to advocate such protective measures as will protect the American people from unsound and unethical means of profit.

It is well also that we recall to mind the fact that our entire system of taxation is based upon profit. Thus the elimination of profits would mean the abolition of the government's source of revenue.

It should be borne in mind also that the destruction of the profit motive would greatly reduce the buying power of the public.

It is apparent, therefore, that the Administration is fully cognizant of the value of the profit system and is equally aware of the need to eliminate its abuses. From this it may be assumed that governmental participation in business and in relief is only an emergency expedient and not to be interpreted as a plan to usurp the rightful role of private business.

Perhaps a return to prosperity has been retarded in some degree by unfavorable sentiment and by a lack of complete understanding of the basic philosophy of the New

Deal, but I believe that as business observes the unfolding of the government's policies it is becoming increasingly desirous of lending its wholehearted support. It is the function of the Department of Commerce to facilitate as much as possible this cooperation between industry and the Administration.

As I study the reports that come to me of business conditions throughout the country I note that exports of machinery for the first ten months of 1934 were more than \$178,000,000, an increase of approximately \$78,000,000 over the corresponding ten months of 1933. The exports of passenger automobiles and trucks for the first ten months of 1933 were \$43,000,000 and for 1934 this figure increased to \$107,000,000. Similar reports for other major industrial commodities, such as iron and steel products, copper, chemicals, etc., show sizable increases in exports in terms of dollars. I interpret this to mean that

the efforts of the Administration to encourage business are meeting with success and that we shall see greater increases in the future.

By carrying the significance of these figures further, I feel that this increase in our exports indicates that our manufacturing concerns must be employing more men and using more materials. Net sales of wholesalers increased a billion and three-quarters dollars or about 14 per cent last year. Retail sales increased about three and one-half billion dollars during the same period. This was the first yearly increase in the dollar value of retail sales since 1929. This seems to indicate that the velocity of money is gaining and that as its rate of circulation increases business will feel an increasing demand for goods. A greater demand for goods will mean profits and through profits the Administration sees the employment of more men and the decrease in relief rolls.

JUST AMONG OURSELVES

A Hot Potato for Congress

IN a message that stated problems rather than offered solutions, the President last week requested the extension of the National Industrial Recovery Act for two years. But this time the President's message was not followed by a draft of the legislation desired as has been the quite common practice of the present administration. So the future of NIRA is now squarely up to Congress although the executive branch of the Government undoubtedly will exert its influence in the pulling and hauling that will go on before new legislation is enacted.

About the only definite recommendation made by the President was that authority to ban child labor and to fix maximum hours and minimum wages, should be continued. He said labor's right to organize for collective bargaining should be protected but gave no indication of how. So Congress conceivably can provide anything from Section 7a in the present statute to the Labor Disputes Bill introduced last week by Senator Wagner. On the vital question of restraints on competition, the President condemned private monopoly, asked for more adequate application of the anti-trust laws, and advised governmental supervision over the natural resource industries. What Congress will do with these generalities is anybody's

guess since the door is open for any action from declaring coal, oil, gas, etc., public utilities to giving full force to the Sherman and Clayton Acts.

Meanwhile, the fact that business will be on the anxious seat while Congress juggles this hot potato isn't likely to have a stimulating effect on recovery.

* * *

Old Age Pensions and Mass Saving

THE whole old age pension plan undoubtedly is the most stupendous venture in mass saving ever undertaken. To get a rough idea of what it means in the way of thrift, we have made a few actuarial calculations. They show that for each person reaching 65 and entitled to the maximum pension, there should be saved in the reserve fund a principal sum amounting to about four times his average annual earnings (up to \$1,800), during the period in which contributions were made in his behalf. This estimate is based on 3 per cent interest and a life expectancy at age 65 of 12 years.

Of course, there won't be that amount in the reserve fund, at least not before the year 2000 for any large proportion of workers, since, as the Government admits, the plan as proposed is not actuarially sound. The difference will have to come out of taxes.

Teamwork on Insurance Losses

GENERAL MOTORS, being in the automobile insurance business through its subsidiary the General Exchange Insurance Co., has more than an academic interest in minimizing loss and damage payments on the policies of the latter company. As a result, it is interesting, although perhaps not surprising, to note that GEIC has enlisted the cooperation of the engineers of the manufacturing divisions in making changes that will reduce such payments. Livingston L. Short, GEIC president, tells something about what has been accomplished along this line in the current issue of GMAC's house organ, *News and Views*.

In one case, it was found that both ends of the gasoline tanks on certain trucks were attached rigidly to the frame members. When the frame twisted, the tank seam opened up and a fire ensued. Now the tank is mounted with only one end attached to the frame.

In another case, adjusters handling stolen tire claims found that the carriers were broken, and that in all probability the tires had been lost rather than stolen. When the matter went to the engineers, they found that the carrier was defective and designed a new one to solve the problem.

In still another case, assureds were reporting cars as stolen and insisting that they were locked inside and out. When some of these cars were recovered, there was no evidence that the locks had been tampered with. Subsequently it was found that by putting a screwdriver between the no-draft window and the ledge and applying pressure, the ratchet would turn permitting the window to open. This situation also has been remedied.

The Editors

Wage, Hour and Earnings Data for Members of the APEM Code

THE tables presented here are from a report originally presented at the recent annual meeting of the APEM of data prepared for NRA for use in its study of automotive employment.

The group of six tables included in the special study of five original equipment companies covers companies who sell 95 per cent of their output to car manufacturers. All of these companies are in the so-called independent group, being in no way connected financially with any of the automobile manufacturers. It will be noted that both man-hours and payrolls and to a lesser extent employment follow the seasonal variation in motor vehicle production. Because of this correlation, the report points out that the APEM code must have no more restrictive hours provisions than those in the car makers' code.

It is interesting to note that in 1929 the average hours per month per employee were 211, whereas in 1934 they amounted to 146. This drop in hours worked plus a slightly lower average hourly rate last year, resulted in a decrease in monthly earnings from \$147 to \$95. However, throughout 1934, hourly rates rose steadily and at the end of the year were close to the rates in effect in 1929.

The table summarizing wage and hour reports of 47 original equipment companies gives detail information for last year by four-week periods. The average weekly hours columns in this table show that in no four-week period did the hours of employees in the 40-hr. category average above 40 per week, while in the 42-hr. classification the averages exceeded that figure in only three periods. Office workers averaged over 40 hrs. in five periods. In connection with these weekly average figures, it should be recalled that the APEM code permits averaging of hours in much the same manner as does the automobile manufacturing code.

The steadier employment provided by replacement parts companies as compared with original equipment manufacturers is illustrated by the table consolidating the wage and hour reports of 12 such companies. This, of course, is due to the fact that the market for maintenance is influenced possibly to a lesser degree by seasons and also because it is not affected by model changes.

A summary for the entire industry is also presented in the report but the number of companies reported varies somewhat from one four-week period to another, so that the figures are not strictly comparable. On the basis of

reports received, however, the industry's payrolls totaled in excess of \$150,000,000 in a 52-week period ending

about the middle of November. Total employment during this period varied
(Turn to page 336, please)

Special Study Five Original Equipment Companies

		Employees				
		1929	1930	1931	1932	1933
January	16,082	12,128	9,700	9,246	6,612	14,740
February	16,962	12,912	10,165	9,256	6,211	18,949
March	18,342	12,733	11,124	7,874	5,182	20,164
April	18,624	13,070	11,425	7,175	5,956	20,495
May	18,052	12,790	11,318	6,979	6,992	17,100
June	17,326	11,746	9,890	6,802	8,083	18,616
July	16,787	11,718	8,915	6,023	9,064	12,789
August	15,723	11,220	8,426	5,099	10,156	11,874
September	15,270	10,667	7,743	4,860	10,209	9,646
October	13,424	9,546	6,922	5,316	8,721	8,045
November	10,757	9,377	8,000	5,684	8,680	9,223
December	10,690	9,789	8,995	6,496	11,806

		Hours				
		1929	1930	1931	1932	1933
January	4,036,135	2,534,424	1,658,209	1,812,880	1,296,336	2,582,011
February	3,823,353	2,375,616	1,839,150	1,528,484	1,007,613	3,056,996
March	4,357,181	2,759,184	2,276,124	1,181,588	697,578	3,538,658
April	4,472,538	2,763,990	2,283,171	881,081	1,198,654	3,201,885
May	4,178,224	2,565,319	2,208,653	1,026,362	1,568,917	2,568,854
June	3,824,152	2,078,888	1,540,997	975,241	1,947,934	2,051,576
July	3,499,367	1,958,243	1,123,319	658,679	1,804,189	1,660,864
August	3,276,665	1,896,306	1,275,811	505,576	1,829,153	1,482,087
September	3,078,645	1,760,409	1,159,021	535,232	1,472,584	1,063,185
October	2,641,046	1,678,456	1,204,977	745,840	1,113,323	1,000,071
November	1,596,402	1,457,530	1,372,659	907,553	1,273,538	1,272,433
December	1,822,659	1,523,342	1,711,984	1,301,807	1,938,493

		Payroll				
		1929	1930	1931	1932	1933
January	\$2,704,660	\$1,742,705	\$1,095,115	\$1,093,574	\$622,332	\$1,474,993
February	2,640,131	1,643,718	1,221,530	921,924	501,585	1,861,349
March	3,027,778	1,928,799	1,497,056	719,711	344,321	2,204,381
April	3,131,944	1,923,702	1,503,988	514,833	589,344	2,112,580
May	2,924,721	1,792,305	1,454,687	584,070	763,999	1,724,593
June	2,673,569	1,440,540	1,011,169	550,529	952,792	1,275,208
July	2,546,087	1,369,275	742,474	362,749	905,657	1,134,600
August	2,265,960	1,328,170	846,029	294,871	1,011,209	1,016,316
September	2,136,188	1,225,258	767,244	317,848	842,984	735,977
October	1,843,716	1,172,309	805,042	422,062	655,192	704,590
November	1,141,927	1,012,529	911,004	493,644	776,955	870,639
December	1,254,724	1,044,279	1,116,853	677,246	1,123,014

		Average Hours Per Month Per Employee				
		1929	1930	1931	1932	1933
January	250	208	170	196	196	175
February	225	183	180	165	162	167
March	237	216	204	150	134	175
April	240	211	198	122	201	156
May	231	200	195	147	224	150
June	221	175	155	143	240	151
July	208	167	126	109	199	129
August	208	169	151	99	180	130
September	201	164	149	110	144	110
October	196	174	174	140	127	124
November	148	155	171	162	146	137
December	170	155	190	200	164	...

		Average Rate Per Hour				
		1929	1930	1931	1932	1933
January	.67	.687	.66	.603	.48	.571
February	.69	.691	.664	.603	.497	.608
March	.694	.699	.657	.609	.493	.622
April	.70	.695	.658	.572	.491	.659
May	.699	.698	.658	.562	.486	.671
June	.699	.692	.656	.564	.489	.621
July	.727	.699	.66	.55	.501	.683
August	.691	.70	.663	.583	.552	.685
September	.693	.696	.661	.593	.572	.692
October	.698	.698	.668	.565	.597	.704
November	.715	.694	.663	.543	.61	.684
December	.688	.685	.652	.52	.579	...

		Average Monthly Earning Per Employee				
		1929	1930	1931	1932	1933
January	\$168.18	\$143.69	\$112.89	\$118.27	\$94.12	\$100.06
February	155.64	127.30	120.17	99.60	80.75	98.22
March	165.07	151.48	134.57	91.40	66.44	109.32
April	168.16	147.18	131.64	71.75	98.94	103.07
May	162.01	140.13	128.52	83.68	109.26	100.85
June	154.80	122.64	102.24	80.93	117.87	93.65
July	151.68	116.85	83.28	60.22	99.91	88.71
August	144.11	118.37	100.40	57.82	99.56	89.35
September	139.89	114.86	99.08	65.40	82.57	76.29
October	137.34	122.80	116.30	79.39	75.12	87.58
November	106.15	107.93	113.87	88.40	89.51	94.39
December	117.37	106.67	124.16	104.25	95.12

Factors Controlling E

A NEW and interesting analysis of the factors controlling engine combustion and suggestions to attain higher engine efficiency is presented in this treatise by the authors.

Combustion curves from indicator cards are for the first time fully corrected for piston movement.

Corrected combustion curves tell how combustion can be controlled by simultaneous firing of two spark plugs, and the advantages thus derived by high compression engines. Ionized gap oscillograms taken simultaneously with the indicator cards were used to plot flame front diagrams.

Part One Part Two will appear in an early issue

these controlling factors on the characteristics of engine combustion.

Combustion characteristics of a given chamber fired at a given position are reflected by part of a pressure-time curve which represents the period starting at ignition and ending when com-

THERMAL efficiency is not the only criterion for the efficiency of combustion in a modern automotive powerplant. Besides converting as much as possible of the fuel energy into useful work, combustion should be smooth and free from detonation. Good idling and high-speed performance are also important.

The means employed to fulfill these requirements are, in general, well established. They involve the following controlling factors:

1. Combustion-chamber shape.
2. Spark-plug position.
3. Mixture proportion.
4. Thermal exchange between gas and chamber walls, including cylinder, valves and piston.
5. Ignition timing (piston movement).

The object of this analysis is to evaluate and correlate the effects of

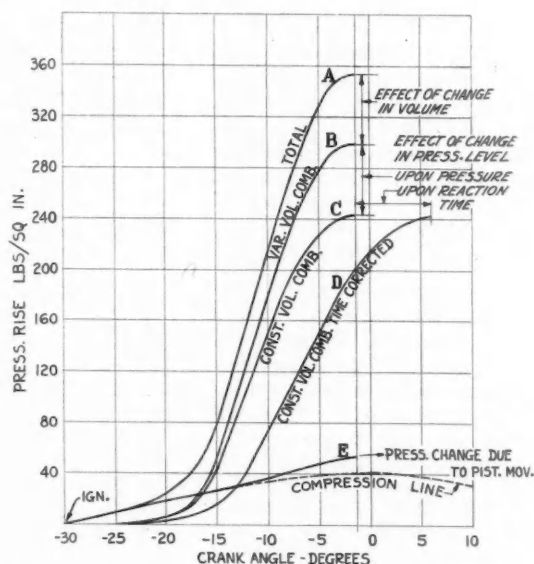


Fig. 2—Total and component pressures during combustion

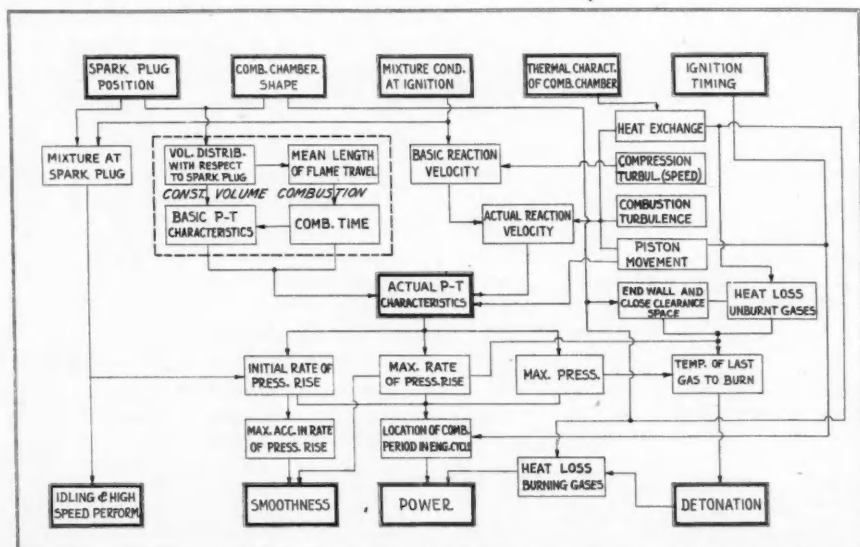


Fig. 1—Factors affecting engine combustion

Engine Combustion

by Hector Rabezzana
and Stephen Kalmar

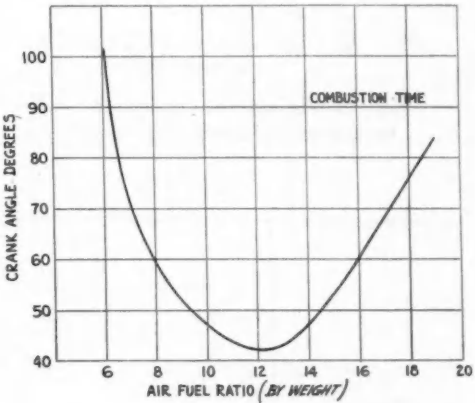
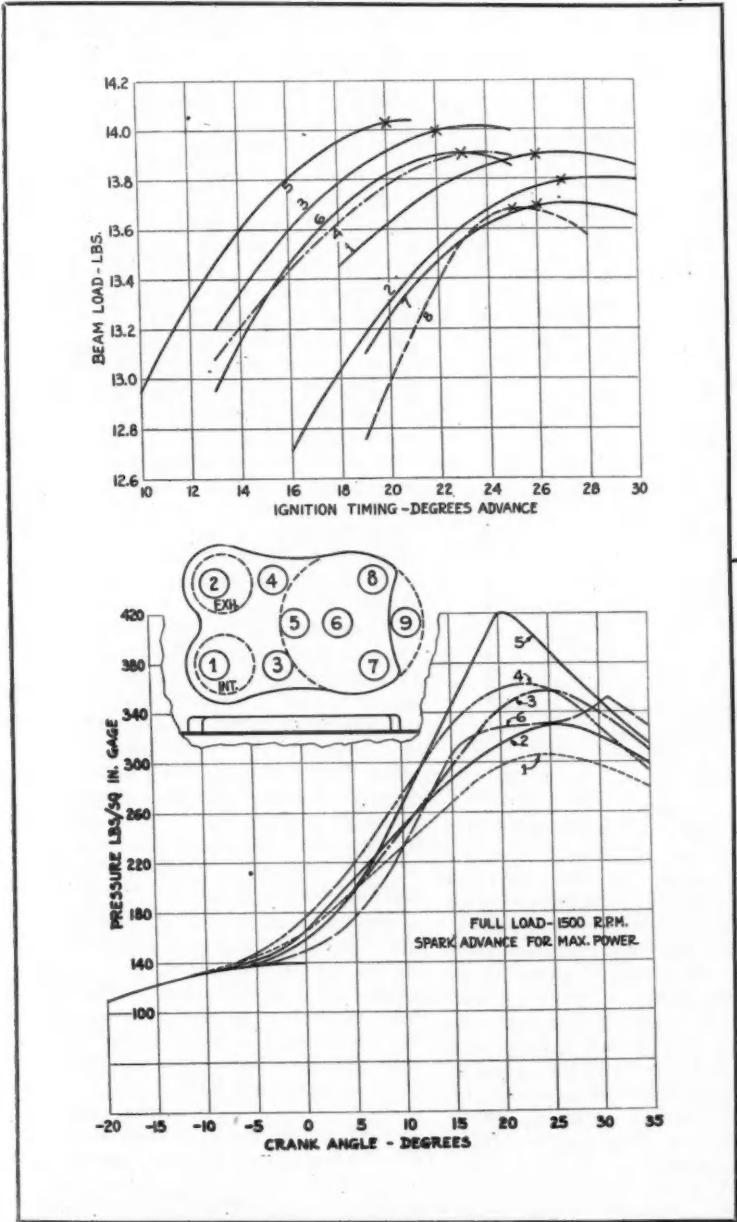


Fig. 4—Effect of air-fuel ratio upon reaction time

Fig. 3—Effect of spark plug position upon power and upon P-T Characteristics

Pressure-time curves and corresponding spark-load curves of the chamber shown, fired at position 1 to 6 respectively.

bustion is completed. Due to the fact that combustion takes place at varying volume (determined by piston movement), the combustion curve obtained from an indicator card represents not

only the pressure rise due to combustion, but also the effects of piston movement during the reaction. Eliminating the effects of piston movement results in a combustion curve which represents

combustion at constant volume, with the piston assumed stationary in the position corresponding to ignition. A method of converting pressure-time curves, representing total pressures has been developed by the authors.

While the final comparison of combustion characteristics of different chamber designs or firing positions should be based on *p-t* curves representing total pressures (i. e. including all the effects of piston movement), the constant-volume combustion curve can be used for comparing inherent characteristics of chamber designs, independently of the effects of piston movement. Obviously, a theoretical *p-t* curve developed from the geometry of the chamber (volume distribution) and based upon sound thermodynamical assumptions should coincide with the constant-volume combustion curve derived from the indicator card.

To make the analysis easier to follow, all the factors in question are

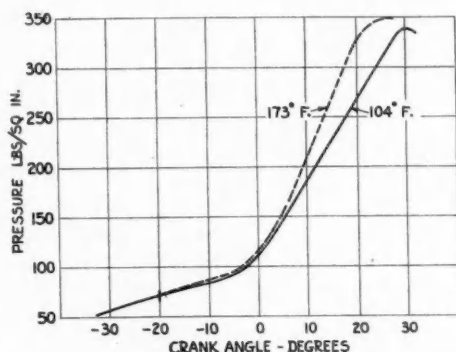
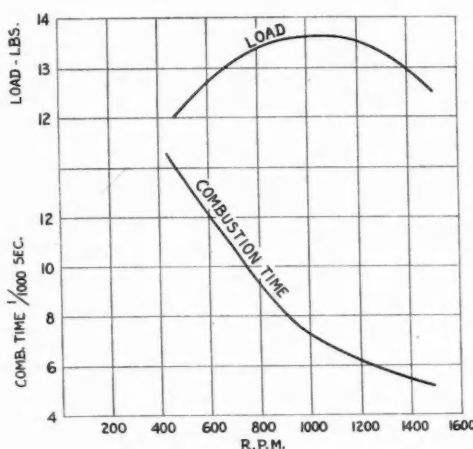


Fig. 5—Effect of chamber wall temperature upon the reaction

Fig. 6—Effect of engine speed upon reaction time

Reaction time is a function of compression turbulence, which is proportional to engine speed.



graphically correlated in the synoptical table in Fig. 1.

Combustion chamber shape in itself affects power and detonation only as far as the heat loss from the burning and unburnt gases are concerned (compactness, the shape of the end wall and close clearance space).

Spark-plug position determines, for a given combustion chamber shape, the volume distribution of the mixture in the chamber with respect to the ignition point, and the mean length of flame travel (i. e. radius of equivalent spherical segment). Volume distribution determines the basic (constant-volume) $p-t$ relation; the mean length of flame travel is proportional to the actual combustion time.

Next in our analysis we see how the basic constant-volume $p-t$ relations are modified by various factors to yield the final actual $p-t$ relations. Mixture conditions in the chamber at the instant of ignition determine the fundamental reaction velocity which, however, is

controlled by various factors before it attains its final actual value.

First, depending on the thermal characteristics of the cylinder head (material, wall thickness of chamber, cooling, valve locations and temperatures, piston temperature, etc.) there is heat exchange between container and gases during the reaction. The heat loss from the burning gases affects the power. The heat loss from the unburnt gases determines the temperature of the last portion of the mixture, which governs detonation. The heat loss from the burning gases is affected, to a greater extent, by the time of reaction, than by the flow velocity of the gases. Although both factors affect heat transfer, owing to the large cross section of the burning gas volume, there is a comparatively steep temperature gradient; consequently, the high gas-wall differential applies only to the border layer adjacent to the wall, and, therefore, the effect of reaction time overshadows that of flow velocity. In the

heat loss from the unburnt gases, on the other hand, the velocity is the determining factor, especially in the case of modern L-head combustion chambers, most of which incorporate a close clearance space above the piston, where the temperature gradient is negligible. The flow velocity of both burning and unburnt gases is determined by the reaction rate, or rate of pressure rise, which should be high, first, because it shortens combustion time (resulting in low heat loss from burning gases, and consequently high power) and, second, because it increases the heat transfer from the unburnt gases (resulting in lower temperature of the last portion of the charge and consequently a lower detonating tendency).

Second, the piston movement during combustion affects the rate of reaction by changing progressively the pressure level at which the reaction occurs. This change in pressure at the start of each combustion increment affects, on the one hand, the final pressure in that increment and, on the other hand, the time which is necessary to complete the reaction in the same increment (effect of starting pressure upon final pressure and upon reaction time). In addition, we have the effect of turbulence originated by piston speed. We distinguish between compression turbulence and combustion turbulence; the former is proportional to engine speed and affects the reaction velocity of the mixture *a priori*; the latter is an effect of the changing piston speed during combustion, and as far as test results at hand indicate, it depends on the relation of flame-front speed and instantaneous piston speed (in magnitude and direction).

Thus, from the basic $p-t$ relation (based on volume distribution only), through the effects of the actual reaction velocity, we arrive at the actual $p-t$ characteristics. Here the piston movement (once more) introduces another factor, due to the volume change during combustion. The effect of the piston movement is, of course, governed by ignition timing, which is the last of the five basic factors controlling combustion efficiency.

The various effects of ignition timing (piston movement) are best illustrated by converting a $p-t$ curve, as given by the indicator card, into a constant-volume-combustion curve. In Fig. 2, curve A represents the pressure rise obtained from the indicator card. By subtracting the pressure change caused by piston movement (curve E) we obtain curve B, which represents the pressure rise due to (variable-volume) combustion. Correcting for the change in rate of pressure rise due to the change in pressure level (piston movement) we obtain curve C, and finally, by correcting for combustion time in proportion to the changing pressure level, we have curve D, which represents the assumed case of constant-volume combustion.

The actual $p-t$ characteristics of combustion, as represented by the combus-

tion line in an indicator card, furnish three important elements necessary for analysis. First, the initial rate of pressure rise—that part of the pressure line which extends from ignition to the point where the rate, generally, becomes maximum. While the mixture quality at the plug has some effect upon this initial part of the cycle, the same is fairly well established by the initial volume distribution. (The pre-pressure period or pressure lag is discussed later.) The initial rate of pressure rise governs the maximum acceleration in the pressure rise curve which is one of the factors controlling smoothness.

The second important element obtained from the $p-t$ curve is the maximum rate of pressure rise, i. e., the maximum slope of the curve. This is the other factor controlling smoothness; it is the most sensitive component of the combustion curve; it reflects any change in mixture, heat exchange or ignition timing.

The third and last of the basic elements obtained from the $p-t$ curve is the peak pressure which is proportional to the maximum rate of pressure rise. It is one of the contributing factors controlling the temperature of the last part of the unburnt charge, which governs detonation.

Ignition timing locates the combustion line in the cycle and hence is the

final controlling factor determining the value of all components of the $p-t$ curve and consequently, of the indicated power.

The combustion chamber contour, if designed to control detonation, deter-

mines the shape of that portion of the chamber in which the last part of the burning takes place, i. e., the end wall of the main chamber and the so-called close clearance space. These two design factors, together with the thermal

Fig. 8—P-V diagrams evaluated from the curves in Fig. 7

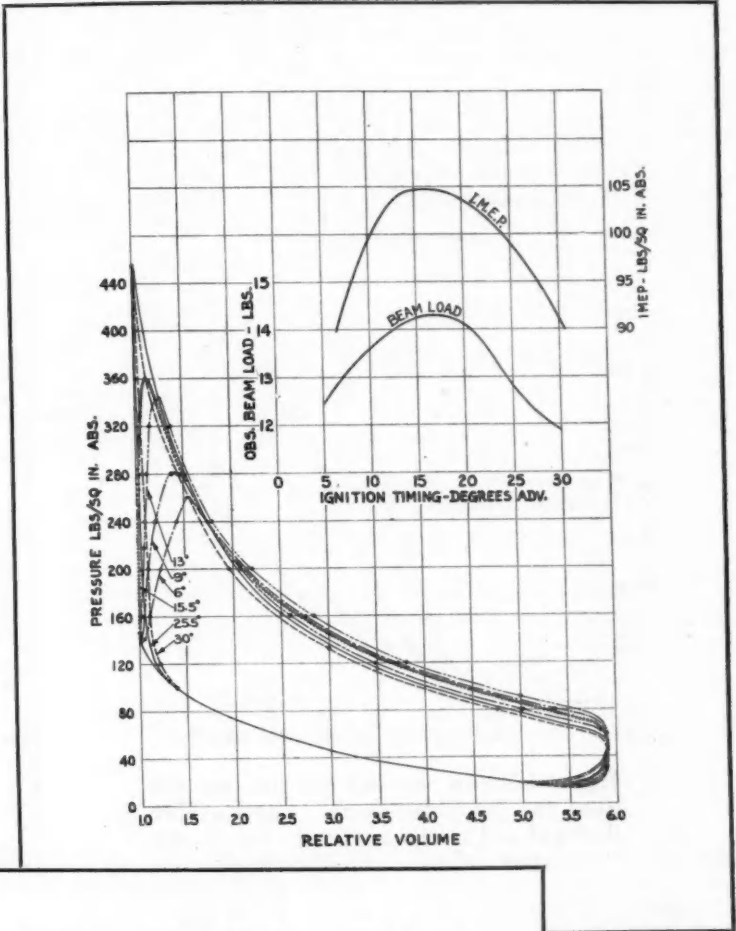
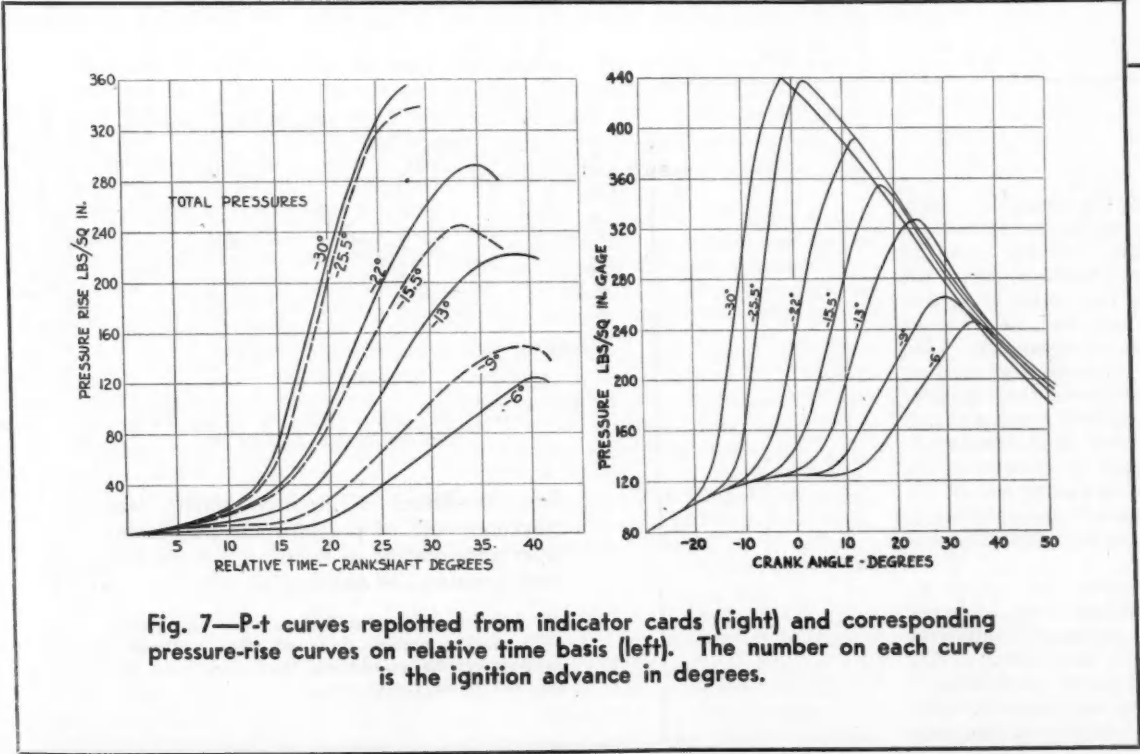


Fig. 7—P-t curves replotted from indicator cards (right) and corresponding pressure-rise curves on relative time basis (left). The number on each curve is the ignition advance in degrees.



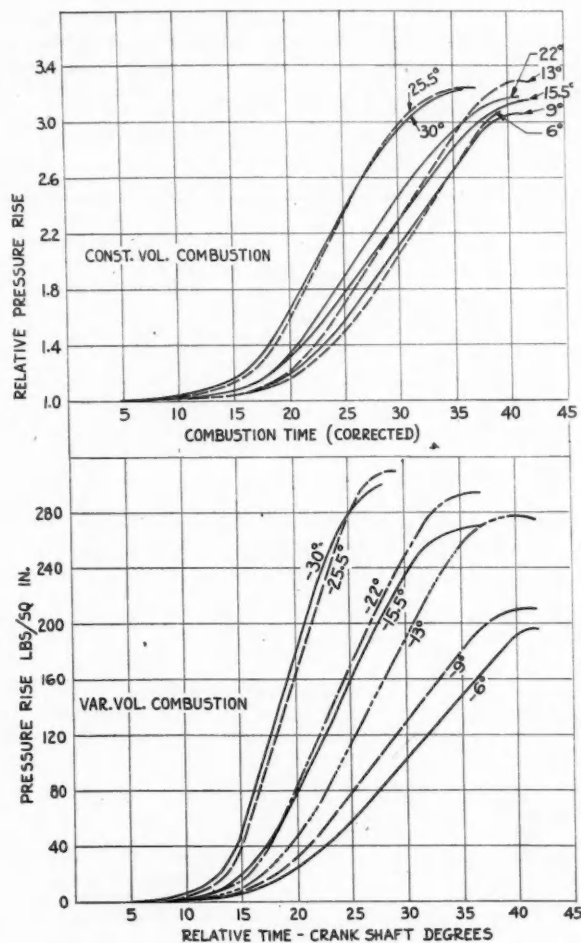


Fig. 9—Curves showing the pressure rise due to (variable-volume) combustion (bottom) and for the assumed case of constant volume combustion (top)

characteristics of the chamber, determine the heat loss of the unburnt gases during combustion; but the rate of cooling is largely dependent upon the flow velocity of the unburnt gases, which is determined by the rate of pressure rise (rate of expansion of the burning gases). The rate of cooling of the unburnt gases and the temperature level in this critical portion of the chamber (which level is indirectly affected by the maximum pressure) determines the final temperature of the last part of the unburnt gases, which is the governing factor in detonation control.

Excessive detonation may cause an increase in the heat loss from the burning gases due to increased radiation, with subsequent loss in power.

Idling and high-speed performance are functions of the mixture conditions (inflammability) at the spark-plug gap.

This is largely affected by the general condition of the mixture in the chamber and the location of the plug.

Having thus established the interrelations of the most important factors affecting combustion efficiency, it will be of interest to gain some quantitative idea of the effects of some of the discussed variables.

Fig. 3 shows a series of $p-t$ curves replotted from actual indicator cards, representing the pressure-time characteristics of the combustion chamber shown, fired at locations 1 to 6 respectively. We see here the effect of plug location (volume distribution) upon the final $p-t$ characteristics. The ignition timing is "minimum advance for maximum power" in all cases. (See the spark curves in the same figure.) Position 5 undoubtedly gives the highest peak pressure, and it is clearly seen

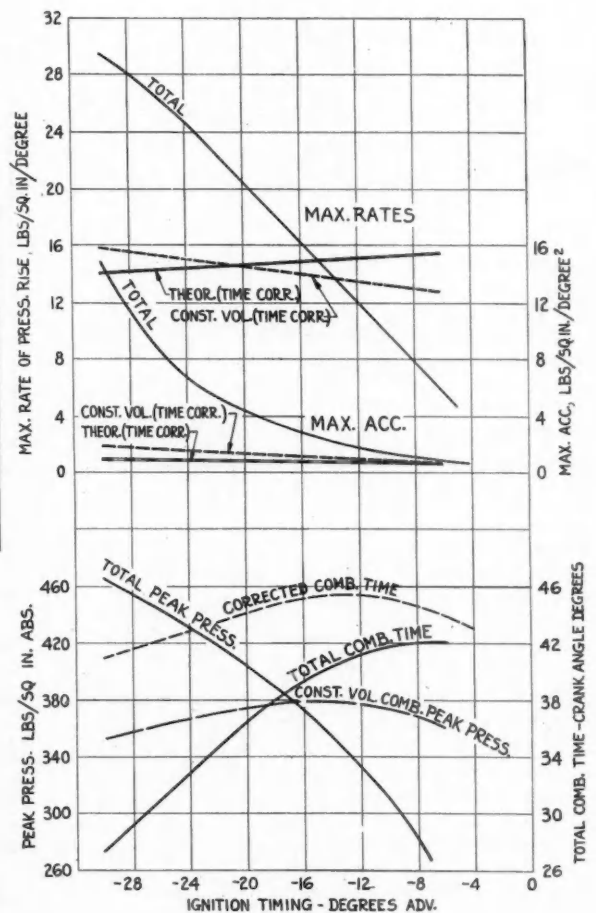


Fig. 10—Effect of ignition timing upon maximum rate of pressure rise (top), maximum acceleration of pressure rise (middle), peak pressure and combustion time (bottom)

All four characteristic factors vary considerably with ignition timing; however, when reduced to constant-volume conditions they vary very little over the whole timing range.

that the maximum rates vary considerably from position to position. It is of interest to note that the pressure line, when firing at Position 6 (which is closer to the piston than to the hot exhaust valve) shows evidence of detonation (sudden sharp rise, at the end); owing to the position of the spark plug in this case, the close clearance space becomes ineffective.

The effect of mixture conditions upon reaction rate is shown in Fig. 4, where combustion time is plotted against the air-fuel ratio. Combustion time is the shortest for a ratio of 12 to 1 and increases rapidly on either side of the maximum power ratio.

How the temperature level of the cycle (chamber-wall temperature) affects the reaction rate, is shown in Fig. 5, which represents the pressure rise replotted from indicator cards taken under the same operating conditions, except that the cooling-water temperature was decreased from 173 to 104 deg. F. The slower rate of combustion is evident from the lower water temperature.

The effect of engine speed (compression turbulence) upon reaction rate is illustrated in Fig. 6. The combustion time in seconds is shown here as it varies with engine speed.

To determine the effect of ignition timing, a separate test series was run, using a mixture of 50 per cent benzol and 50 per cent Ethyl gasoline, which enabled us to cover the entire spark-advance range without detonation. The $p-t$ curves replotted from indicator cards taken in this test series are shown in Fig. 7 on the right side; on the left side we see the pressure rise curves plotted against relative time, and in Fig. 8 the corresponding $p-v$ diagrams. If we subtract the pressure changes due to piston movement, we obtain the (variable-volume) combustion curves shown in Fig. 9 at the bottom; these curves show the pressure rise due to combustion only, corresponding to curve B in Fig. 2. To check the method developed for converting to constant-volume conditions, the same series of $p-t$ curves was reduced to the constant-volume basis and the resulting curves are shown at the top in Fig. 9. As seen, all the curves on the constant-volume basis are very similar, indicating that the method employed is sufficiently accurate. From the curves in Figs. 7 and 9 the maximum rates and the maximum accelerations of the individual $p-t$ curves were evaluated. For comparison, they are plotted in Fig. 10. We see very distinctly that the characteristic factors, i. e., the maximum rate of rise and the maximum acceleration in the pressure-time curve, as well as the combustion time and peak pressure, varies considerably with ignition timing. Considering the maximum rate of rise of the total pressure curves (first group of curves at top), we see that their value ranges from 5.5 to 29.0 lb. per sq. in. per degree (at 6 and 30 deg. advance respectively). Reducing the pressure curves to constant-volume-combus-

tion conditions, the variation in the maximum rate of pressure rise will be only from 13.0 to 15.8 lb. per sq. in. per degree. For comparison we have plotted the theoretical $p-t$ curve calculated by an analytical method based on the following assumptions:

1. The unburnt charge is compressed isothermally.
2. The pressure at any time during combustion is proportional to the percentage of charge burnt.
3. The flame velocity is proportional to some power of the pressure,

and reduced to the same conditions (starting pressure and combustion time) as the actual (constant-volume combustion) curves. The two curves are in very good agreement.

The second group of curves in Fig. 10 represents the comparison of the maximum acceleration of the pressure curves for the same conditions.

The third set of curves shows the variation of the peak pressures (total pressures) and of the combustion time, when the ignition advance is increased from 6 deg. B.T.C. to 30 deg. B.T.C. The peak pressures for constant-volume combustion are also shown; they vary little over the whole advance

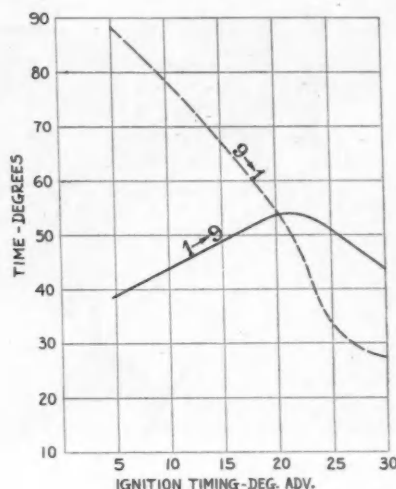
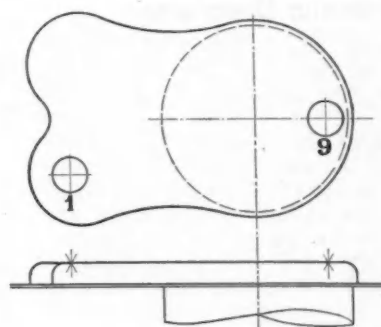
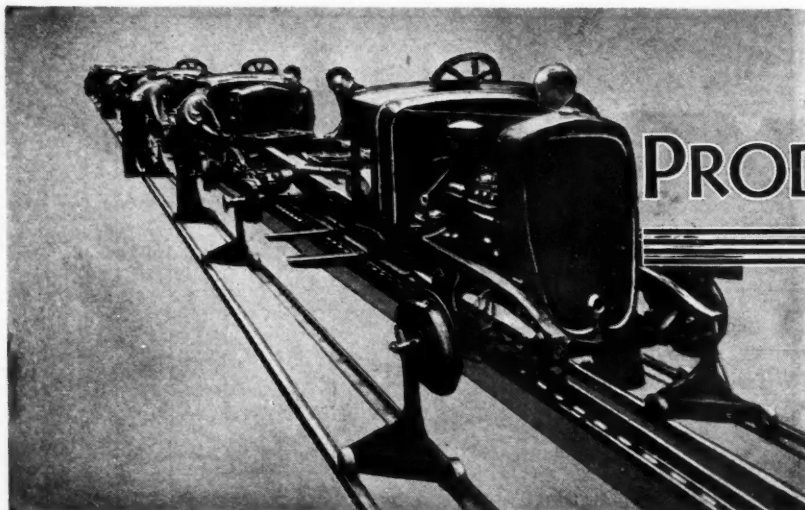


Fig. 11—Flame speed and piston movement

The flame front originated at 1 reached 9 in the time represented by the solid line; originated at 9 it reaches 1 in the time represented by the dotted line. The trend of variation of the two curves against spark advance is fundamentally different, due to the difference in the relation of speed and direction of the piston and of the flame.



range. As seen, the corrected combustion times are not quite uniform; there is a variation of four degrees. This is due to the fact that the effect of one factor, namely that of combustion turbulence, has not been included in the correction. Combustion turbulence is originated by the directional effect of piston movement upon the reaction zone. That such an effect exists can be seen from Fig. 11, in which the solid line represents the time necessary for the flame front, originated at point 1 (ignition point) to reach point 9 during actual engine operation at constant speed and constant throttle, the ignition timing being varied from 5 to 30 deg. B.T.C. The dotted curve represents the time for the flame travel from point 9 (ignition point) to point 1 under the same operating conditions. The trend of variation with spark advance of the solid and dotted curve is fundamentally different; the reason for the difference in flame speed for the same spark advance is most probably the different relation of speed and direction of piston and flame movement. The investigations of this phase of combustion are not yet completed and the data at hand do not permit definite quantitative conclusions.



PRODUCTION LINES

Logarithmic Diagrams

A paper on the study of cylinder events by means of the logarithmic diagram was presented by Alfred T. Gregory of the Wright Aeronautical Corp. Mr. Gregory described the properties of the logarithmic cylinder diagram and explained methods of determining the cylinder temperature and the internal energy from the diagram. He also gave full analyses of logarithmic indicator diagrams taken from an Hispano-Suiza engine, a supercharged Cyclone engine, and an air-injected Diesel engine.

Better Lubes

Along the discussion of improved engine lubricants comes the matter of defining the useful properties of these materials. For instance, consider *oiliness*. What is it; how may it be measured; how defined? More recently, Sperry has proposed that we consider oiliness as *adhesion* to the metallic surfaces. Here indeed is a fertile field for further research.

Aircraft Digest

International Nickel has just sent us a copy of the 1935 edition of the "Directory of Aircraft Engines." Here is something well worth having. It contains a complete listing of domestic and European aviation engines, giving illustrations, ratings, characteristics, special features, and materials of construction. It's a fine engineering reference book and not a catalog. We can get you a copy.

Diamond Wheels

Norton has just issued a little booklet describing the applications of its diamond wheels. These are intended for dressing and finishing tools tipped with all manner of the

cemented carbides, and hard, brittle materials. Get posted on this development.

For Interiors

Automobile shows always produce some element of surprise. In New York, regardless of the reasons in the background, practically all cars on display, whether of high price or low, were upholstered in flat fabrics. Which, as you know, indicates another swing of the pendulum.

Bearing Stock in Longer Bars

Permite leaded bronze bearing stock in bar lengths up to 6 ft. are now available through the exclusive distributorship of Joseph T. Ryerson & Son, Inc. These longer lengths make it possible to speed production of bearings and bushings on a lathe or screw machine.

Permite bars are available through Ryerson in all the standard bronze alloys, in lengths up to 6 ft. Diameters available are $\frac{5}{8}$ in. to 2 in. by sixteenths, and the stock is turned to an accuracy of plus or minus .002 in.

Low Cost

Plans under way in the Department of Air Commerce contemplate the building of a small aircraft engine suitable for baby carriage planes, at low cost. One accepted design is an air cooled two-cycle engine rated at 100 hp., to cost no more than \$5 per hp. which is about half the present cost.

Road Check

Recent article in British journal throws some light on the moot questions of automotive Diesel operation. The company, W. Alexander and

Sons, operates a fleet of 250 oil-engined buses made by Leyland. Covering a fleet aggregate of 265,000 miles per week, their records show that maintenance cost is but slightly in excess of gasoline vehicle experience. Most important item of maintenance is check on setting and correction of injector pressures which is done every 10 days. Crankcase draining and flushing is important and occurs oftener than with their gasoline equipment. To bear out the statements made by several Diesel men in this country, Alexander expects to find longer life of clutch and gearing on Diesel buses operating in hilly territory.

For Tool Room

A new bulletin defining the field of usefulness of the Keller automatic tool room machine is ready for distribution. It is designed to give you the dope on some of the latest automotive die applications as well as to show the best utilization of the two- and three-dimensional machines. A section on special attachments adds to the value of the bulletin. Ask us if you want a copy.

Bet A Suit

Are you a gambling man? We have just heard from one of our pals (who has been, and still is, very close to the automotive Diesel development) to the effect that a prominent car builder will have a sensational announcement to make soon. The tip is, according to our informant, that a Diesel-powered car is to be placed on the market within a year—priced at around \$800. Now we're again gambling for many reasons, but this chap is willing to forfeit a suit of clothes if the car isn't announced this time next year.—J. G.

MANUFACTURING
MANAGEMENT
METALLURGY

Facts Challenge Conclusions in Henderson Report

CAR manufacturers who have carefully examined the NRA report on automotive employment have discovered that it contains many inaccuracies and wrong inferences, especially in the section dealing with technological improvements since 1929.

A reading of that section leaves one with the feeling that men are being replaced with machines so rapidly that soon the motor car industry is likely to need relatively few workers because most everything will be done automatically. This inference is not supported by facts. While it is true that the trend toward smaller cars would seem to cut down the man-power necessary to make the average car, manufacturers, endeavoring to build bigger and better cars in the low-price range, have added much equipment not on the 1929 automobile.

The result of this and other factors is that just as many man-hours are required today (around 140) to build the average car as six years ago. Tabulations made by the Automobile Manufacturers' Association from data furnished by its members prove this fact. What car of 1929 vintage had independent springing, controlled ventilation, special chrome-plated radiator grille and numerous gadgets found on today's car?

Alleged Savings in Labor Impossibly Big

Fabrication of a car top from a single piece of sheet steel, as against 47 pieces which made up the top assembly in 1929, is cited in the report as a spectacular achievement of mechanization and simplification. Most devastating from labor's standpoint in this development was the elimination of 48 man-hours of work formerly necessary. Body manufacturers are understood to have compiled figures showing that never in the history of the industry has the building of an entire body taken as much as 50 man-hours of labor. Moreover, in the assembly of the top section of the body a number of small parts, all of which require some human labor in their fabrication, are used along with the one-piece steel unit.

The same criticism can be applied to the report's description of the manufacture today of the one-piece underbody. The actual decrease in labor is

small, being only a fraction of the 50 hours named by the investigators.

No volume producer of car bodies possesses records showing that the tooling work and the dies for an average 1928-29 four-door sedan cost as little as \$75,000, as indicated in the NRA report. The expense was several times that figure. On the other hand, the labor cost of a door in 1929 was far below the \$4 cited in the report. Such costs, distributed proportionately through an entire body, would make the price of the body prohibitive.

Although it is true that a certain body manufacturer has discontinued operations permanently at its former wood mill, which in 1928 employed 3000 men, it is buying far more steel today than it ever has before and needs additional workmen to handle and fabricate it.

More Polishers Than in 1929

Thirty dollars has been slashed from the cost of building bodies in the last six years, according to the report. Body manufacturers acknowledge that savings have been made, but point out that it is erroneous to assume that anywhere near the full amount has come out of reduced labor costs. What about reduced commodity prices? What about lower profit margins?

The report dwells at some length on the elimination of workers by the installation of automatic polishing and buffing machines throughout the industry. It is true that men have been displaced by the shifting of operations, but the over-all results reveal no alarming reduction in the total man-power required to do polishing and buffing work. A prominent automobile hardware manufacturer is employing more polishers and buffers today than in 1929. The reason is that 1935 cars have more plated parts by far than the car of six years ago.

Speed-ups come in for wholesale condemnation in the report. Yet the speeding up of an operation or an assembly is not in itself evidence of a condition injurious to a workman's health. Admittedly, a speed-up can be ordered which calls for men to work at an inhuman gait. On the other hand, there is the kind of speed-up which results from scientific study of the motions of workers and of individual operations,

the object being the attainment of higher efficiency through increased production. Materials are brought to the workman's finger tips, heretofore unnecessary movements on his part are eliminated and he is not compelled to use up any more physical energy than before, although turning out more work.

The NRA report declares that "the automobile industry has set a new 'low' age for displacement of workers. Men near 40 find great difficulty in securing jobs with the industry, or being rehired after layoffs... it is socially and economically indefensible for the automobile industry to say that old age comes to its workers from 10 to 20 years prior to the time it comes to any other group of similar workers in the United States."

This statement was made in the face of the fact that the reports of the Bureau of Census show that the proportion of workers in the motor car industry who are 40 or over is around 32 per cent and that the proportion of the total workers in most other industries ranges from 30 to 36 per cent. Being a youthful industry which, during its period of rapid growth has attracted young men from all parts of the country, the automobile industry may have workers whose average age is slightly under that of some other industries, but the difference is so small as to be of minor importance and, as one automotive executive commented, certainly doesn't deserve to be blown up into the importance assigned it in the NRA report.

Both Old and Young Men Needed

No industry is more conscious than the motor car industry of the value to it of older as well as young workmen. The general attitude is typified by a recent statement of W. S. Knudsen, executive vice-president of General Motors Corp., who said, "Industry needs men of 40 or over. A factory should have approximately the same age curve as a normal city of corresponding size, with proportionate numbers of men from 18 to 60. Youthful energy is necessary, but the fact remains that experience of men of 40 or over supplies a needed balance wheel to any organization. The young man

instinctively gravitates toward and learns from the older man if the latter is 'a man' and knows his job."

Pontiac Motor Co. has made a survey of its 5500 men showing that 1456 are 40 years of age or over. Of that number 386 are over 50 years, 66 over 60 years and 3 over 70 years. The average age of all employees is 33 years and average length of employment seven years. All of which refutes the claim that auto workers are discarded when they reach the age of 40. Pontiac also reveals that no employee has been on the welfare roll in Oakland county—Pontiac—the company having assisted every employee in distress without resort to use of public funds.

Increased use of modern machinery and consequent elimination of workers, as emphasized in the NRA report, should logically lead to greater output per man, if what the report charges is true. However, an examination of the statistics compiled in recent years by the Bureau of Census of the Department of Commerce and by the U. S. Department of Labor reveals that the production per man in the automotive industry has declined about 20 per cent in the last few years and this, in turn, has contributed to higher operating expenses.

There are three major factors responsible for this decline in productivity—(1) the larger number of refinements on cars today as against those on cars a few years ago, (2) the reduction in the length of the working week, and (3) the inevitable drop in efficiency on the part of workmen when production is at a low point. Irregularity of employment is hardly conducive to maintenance of the highest efficiency by either individual workmen or an automobile plant.

In 1934 the industry paid higher rates to workmen, the hourly compensation being almost equal to that in 1929, according to the report. At the same time the wholesale price of the average car went up about \$39, on the basis of compilations made by a prominent car manufacturer, instead of the \$8 indicated in the report. What has happened in the last year is that the increased expense of building cars has cost the public an extra \$120,000,000 in higher retail prices and has cost stockholders around \$50,000,000 in the form of reduced dividends, but the report is careful to conceal the fact that the operation of codes cost the country a total of \$170,000,000 more in 1934 than in 1933. The reason that the public "paid through the nose" to the tune of the above figure was four-fold, asserts one company: higher rates paid to workmen, increased costs of materials and parts, and the operation of the retail auto code which reduced trade-in allowances.

Contrary to a widespread belief and to inferences in the NRA report, a study of the month-to-month figures of the Department of Labor, says an important manufacturer, will show that employment was reasonably stable in

the pre-depression years. In fact, it was not until the depression came that violent fluctuations occurred in the employment curve. The trouble was that most companies, misjudging what the future would bring, set up production figures at the beginning of each year, turned out cars based on their projections for four or five months and then suddenly found that they had greatly overestimated their market. They immediately drew in their activities, drastically curtailed operations and laid off men.

The matter resolves itself then into the fact that if every suggestion in the NRA report were adopted, there still would be fluctuations in production and employment because of the inability of manufacturers to forecast accurately their volume of sales. The greatest good from a social and economic standpoint can be accomplished by concentrating not on the application to the industry of financial burdens which would increase car prices and circumscribe the motor car market, but on practical means of anticipating future demand and setting up manufacturing programs accordingly. Car manufacturers already have done this in the adoption of the program for fall introduction of new models. Incidentally, whatever the NRA report says about fall announcements is not the result of original thought, as the public is led to believe, but has been "lifted" almost word for word from a report made to NRA by the National Automobile Chamber of Commerce in December, 1933.

Regarding annual earnings and the number of weeks out of a year worked by automotive employees, car manufacturers emphasize the fact that statistics often can be deceiving. If the floating labor which has been coming into the industry for a few peak months each year and which constitutes possibly 25 per cent of the number employed at the peak period, were removed from the calculations, the results would be much more favorable to the industry and would give a better picture of what the earnings of the experienced automobile worker are. One must remember, of course, that annual incomes in the last year have been pulled down by hour limitations in the code.

On the matter of expanding the incomes of workers, one of the larger corporations has decided to give its experienced employees a chance this year to work to the full limit of the code so that they can increase their wages on an annual basis. That is, the workmen will be kept on their jobs 48 hours a week for as many weeks as possible. This is the most practical means of increasing their earning power and consequently their purchasing power, although it is in direct conflict with the views of organized labor, according to the manufacturer.

The inaccuracies and misstatements of facts already cited, as well as numerous other cases ferreted out by a close examination of the report, hardly

give that document the standing which the usual government report possesses. The errors probably occurred because the information presented was gathered from hearsay evidence rather than official sources. The industry is genuinely concerned over the precedent set by the report. If such a report of jumbled facts can be perpetrated on the automobile industry by a group of investigators who went out to hunt trouble, why can't the Federal Government do the same thing at will to any other industry?

Aerodynamic Theory

Vol. II of the comprehensive work on Aerodynamic Theory which is being published with the financial assistance of a grant by the Guggenheim Fund, under the editorship of William Frederic Durand, has made its appearance. It covers Division E of the general subject, General Aerodynamic Theory, the authors being Th. von Karman, director of the Guggenheim Aeronautics Laboratory, Pasadena, Calif., and J. M. Burgers, Professor of Aero- and Hydrodynamics at the Technical College of Delft, Holland. The material is dealt with in six chapters with the following chapter heads: Basic Ideas of Wing Theory-Flow Around an Airfoil; Theory of Airplane Wings of Infinite Span; Mathematical Foundation of the Theory of Wings with Finite Span; Airfoils and Airfoil Systems of Finite Span; Problems of Non-Uniform and Curvilinear Motion; The Development of the Vortex System Downstream of the Airfoil. The treatment naturally is largely mathematical. The work is being published by Julius Springer of Berlin.

Thompson Introduces New Heavy-Duty Valve

A new heavy-duty valve of aircraft engine valve steel is now catalogued by Thompson Products, Inc., Cleveland, for a number of trucks and buses. The new valve comes with a Stellite seat and stem tip in some instances. For certain other engines the Stellite is omitted. List prices range from \$1.75 upward.

Lycoming Adds Six. Cyl. Marine Engine to Line

The Lycoming Manufacturing Company has added a new six-cylinder engine to its line of marine power plants.

The new six model, to be known as the "Uh," will have a bore of 3 1/16 in. and a stroke of 4 3/4 in., with piston displacement of 210 cubic inches. It will develop 80 h.p. at 3400 r.p.m. It will be available in both direct drive and with a reduction gear.

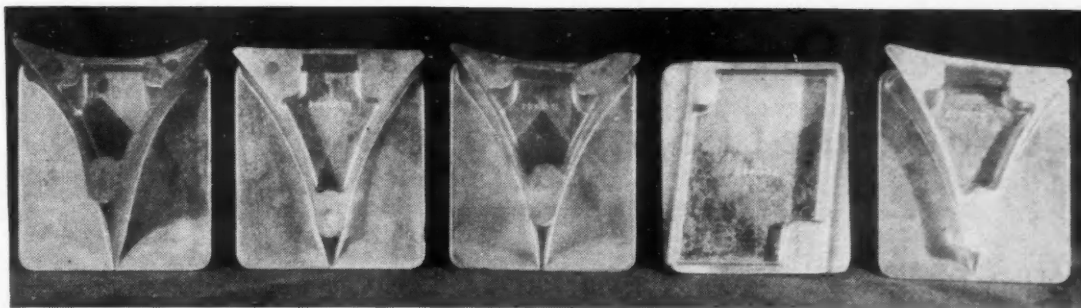


Fig. 1—The five step plates were so designed that the foot pad was the same

Low-Run Step Plate Production Problem Solved by Die-Casting

THAT the economic potentialities of the die-casting art still are largely unplumbed may be gathered from a zinc alloy application recently developed by The Hoover Co. for an automobile manufacturer.

Here was a comparatively low production job, so far as total yearly volume is concerned, and yet the part—a step plate for sport models—was required for five different body styles. The solution was found, first, in a step plate design incorporating the maximum degree of interchangeability, and, second, in a die design which would accommodate all five castings through the use of interchangeable die sections.

The step plates were so designed that the foot pad was the same for the five models, all the variations due to differences in fender contour and height

being taken care of in the lower portions of the casting as shown in Fig. 1.

This made it possible to construct the die, shown in Fig. 2, with one cover half, forming the impression for all five parts as shown at (1), while the ejector half of the die at (2) was made to receive the different inserts and slides to form the lower half of the plates. The cavity in the cover half of the die was sunk to a depth equal to one-half the thickness of the top plate, which formed the parting in the center of radius extending around the outer edge. Into this cavity were cut the diamond serrations which form the safety tread of the step plate.

The ejector half of the die was made to receive the five different inserts, one of which is illustrated at (3), which are the cores for the bottom side of the

plates; and also the five sets of slides, at (4), which form the cavity for the supporting or attaching section of the plates, being moved by means of rack and pinion.

Thus the entire die for these five step plates consists of the cover half, ejector half, five interchangeable inserts with ejector plates, and ten slides, together with ejector box and pinions.

The parts average 1½ lb. each and are cast of New Jersey Zinc Co. Zamak No. 2 zinc base alloy. Because of the heavy sections it was necessary to cast at a very slow rate, in order that the metal could solidify to prevent bleeding after ejection from the die. The parts are finished with the step pad bright chromium plated around the edge and with the under section finished in black enamel.—J. G.

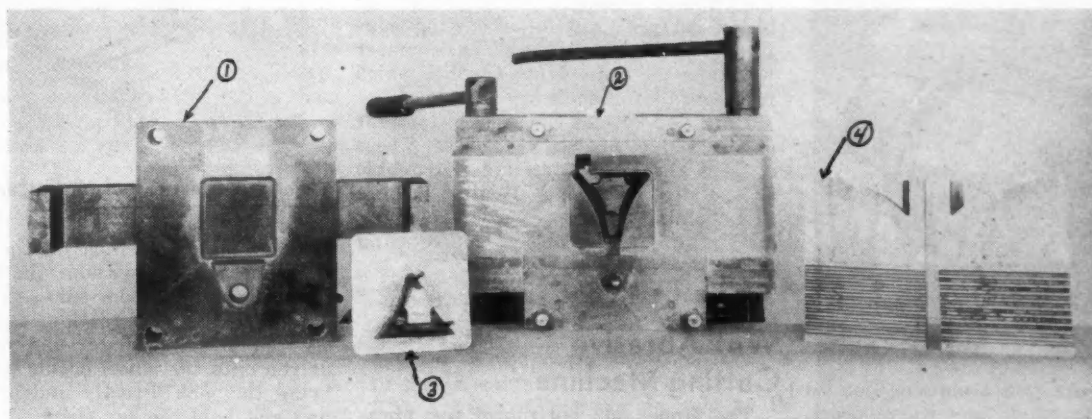


Fig. 2—One cover half of the die sufficed for the five different patterns

NEW DEVELOPMENTS

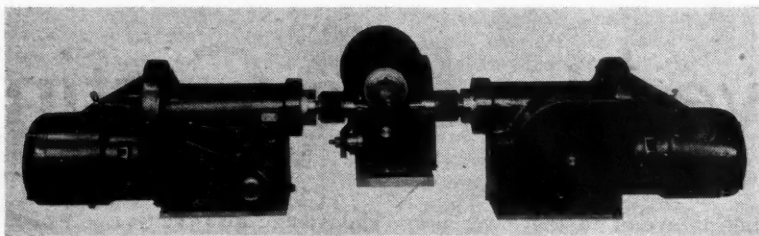
Automotive Parts, Accessories and Production Tools

Automatic Unit Type Drilling Head

An automatic unit type drilling head, No. 0, has been developed by the Bradford Machine Tool Co., Cincinnati, Ohio, to handle the smaller work for which the large Bradford units are not suited.

The unit has a standard maximum speed of 8750 r.p.m., and with the great

of the quill and spindle at all positions of the stroke. The automatic power feed used is based on the design that has operated successfully for years on the larger Bradford units, except that it has been made more sensitive to handle smaller tools. A special friction clutch is interposed in the drive to give it flexibility. This clutch, which is entirely submerged in oil, can be adjusted so that it will drive the tools as long



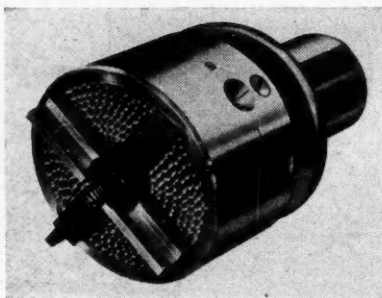
range of intermediate speeds obtainable makes it easy to assure the proper speed for the tool used. Practically any feed can be provided within the range of tools handled by the machine.

To provide proper support of the spindle and quill the No. 0 unit has bearings at both front and rear ends

as conditions are normal; but if excessive pressure builds up it will slip to protect both the tools and the mechanism. Adjustment of this clutch is from the outside by means of the starting lever; a clamp on this lever regulates its travel and also the pressure on the clutch.

Chaser Blade and Holder

An interchange chaser blade and holder in sizes from $\frac{1}{4}$ to 1 in. is announced by the National Acme Company, Cleveland, Ohio, for threading



jobs where changes from one job to another are frequent, and where precision and simplicity of design are important.

The blade chaser slips into a slot in the block, protruding on each end. On one end are the threads of the chaser with the ground cutting edge; on the other end is ground a heel or cam which is seated snugly in the cup and assures accurate opening action. By building the cutting edge and the heel into one blade, correct location of cutting edge is said to be secured, and each chaser will take the same depth of chip, which is essential for accuracy of lead.

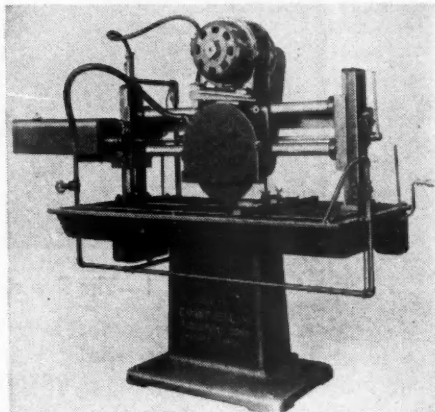
Only two sets of blocks required for entire range of cutting sizes. These chasers and blocks are interchangeable in the dies with the circular chasers and holding blocks of corresponding die size, in the rotating or non-rotating series.

Wet Abrasive Cutting Machine

The Model 302 horizontal wet abrasive cutting machine is an addition to the line made by Andrew C. Campbell

Division of American Chain Company, Inc., Bridgeport, Conn.

This machine was designed primarily for making long cuts through flat or

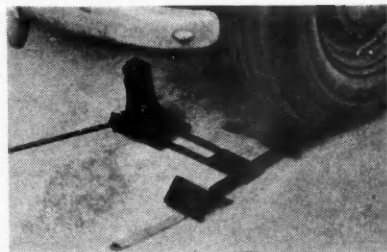


slab stock but bar stocks can also be cut. A unique hydraulic feed mechanism permits the abrasive cutting of larger sizes of flat material than have heretofore been considered practical. This hydraulic feed can be regulated for speed of feed with infinite variations between the maximum and minimum rate.

Cutting is done by a revolving thin abrasive disc to which is applied a continuous and uniform application of a liquid coolant by a special method which also eliminates the danger to workmen because of dust and grit laden air.

Jack Adjuster

John T. Whalen of 1930 Amsterdam Avenue, New York, has developed a device which he calls an automobile jack adjuster and to which he has applied the trade name "Jack-A-Juster." The object of the device as explained by the inventor is to place an automobile jack in the proper lifting position



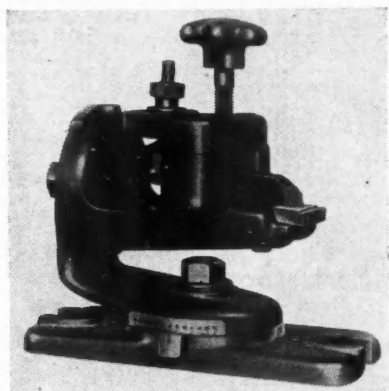
Whalen Jack Adjuster

without material effort on the part of the operator and without the necessity of getting under the car. As may be seen from the illustration, the jack is secured to the adjuster and the car is driven onto the wheel cradle which will bring the jack directly under the jack pad and hold the car there. To permit the wheel rolling off the cradle its pads are collapsed.

Tap Chaser Rake Grinding Attachment

The Landis Machine Company, Waynesboro, Pa., has placed on the market an attachment for use in re-grinding or sharpening the chasers used in their Landis Style LT and Style LM Receding Chaser Collapsible Taps.

The attachment is composed of three main parts; first, a base which is adapted for fastening to the table of



most makes of tool and cutter grinding machines. Attached to the base is a second part, the swivel bracket, adjustable in a horizontal plane in relation to the base. The bottom part of the swivel bracket is graduated to permit obtaining the desired degree of azimuth, which is the angle at which the chaser is set from the parallel. The third part of the attachment is the vise base which is clamped to the swivel bracket and which holds the chaser while being ground. The vise base can be rotated in the vertical plane and securely clamped at any angle as determined by graduations on the top of the swivel bracket.

The vise base is provided with a milled flat which will accommodate all sizes of tap chasers. The chaser is held in place by an adjustable spring clamp and locked with a hand screw.

"Dialux," the New Paint

"Dialux" is a new luminescent paint introduced by the Grobet File Corp., New York, N. Y., the principal element of which is sulphur of calcium, a phosphorescent salt. Sulphur of calcium has this peculiar quality, that after having been exposed to natural or artificial light, even for a very short space of time, it gives off, in the dark, a luminosity which lasts for 12 hours. The glow is very brilliant during the first 15-20 minutes following the exposure to light, then gradually fades away. Dialux paint is permanent. The luminescence of painted articles can be restored time and again by simply repeating the exposure to light.

"Dialux" does not contain any radioactive matter; is not inflammable, nor

toxic. It can be applied on metal, glass, cloth, paper, wood, hard rubber compositions. "Dialux" is made in two varieties: 1, for brush application (resin carrier); 2, for air gun spray application (enamel carrier). Both varieties dry quickly, and are of high mechanical resistance. Covering capacity is 20-30 square feet per pound.

The chief value of "Dialux" consists in indicating the position of objects in complete darkness. It can be used to advantage for the following purposes:

Factories. Fire extinguishers, parts of machinery, hydrants, projecting beams, staircases, dangerous dark corners.

Electricity. Apparatus and instruments of all kinds, switches, live wires, etc.

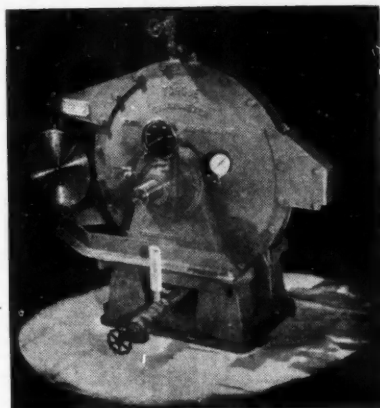
Aeroplanes. Instrument boards, exterior and interior parts; for group flying without lights.

Advertising. Luminous paper, luminous cardboard, which can be printed or lithographed.

Torque Dynamometer

An absorption dynamometer of the hydraulic type, known as the "Torque" dynamometer, has been placed on the market by the Torque Products Co., Milwaukee, Wis. While it is new in appearance, it is a development of a basic design that was introduced 25 years ago. It is claimed to be as smooth and accurate as the electrical type, but more flexible and considerably lower in price.

The Torque dynamometer consists of a stator and one or more rotors adapted to be rotated within the stator. Both stator and rotor are mounted on annular ball bearings. The absorption medium is water, the power absorbed by the dynamometer being dissipated in heat. Scale equipment, connected to the floating stator, measures the torque



"Torque" hydraulic dynamometer

applied to the rotor shaft, regardless of the direction of rotation of the rotor. The water consumption is said to be quite low.

These dynamometers are being manufactured in a range of sizes.

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APEM Wage, Hour and Earning Data

(Continued from page 323)

from 109,648 to 180,515. Hourly factory rates ranged from 54 to 59.9 cents, while office hourly rates ran from 54.6 to 62.8 cents. Average weekly earnings of factory employees ranged from a low of \$18.35 to a top of \$21.32, while

the spread for office workers was from \$19.25 to \$22.67.

A comparison of APEM wage and hour data with similar facts developed by NRA for all coded industries follows:

	APEM	All Coded Industries
Average hours per week	35.9	34.8
Average cents per hour	57.0	59.4
Average weekly earnings, dollars	19.40	19.51
Average employment (1929-100)	88.	75.8

Summary Wage and Hour Reports 47 Original Equipment Companies

4-Week Period End.	No. of Reports	Average No. Employees			Average Hours per Employee per Week			Average Rate per Hour		Total Payroll	Average Weekly Pay	
		40 Hr.	42 Hr.	Office	40 Hr.	42 Hr.	Office	Factory	Office		Factory	Office
12-16-33	36	30,537	8,572	1,970	32.5	43.2	39.2	55.1	59	\$3,210,832.40	\$19.10	\$23.31
1-13-34	42	39,012	9,458	2,189	33.0	39.0	37.0	57.8	61.3	4,041,308.85	19.81	22.83
2-10-34	47	48,613	9,731	2,045	38.0	44.7	40.5	55.6	56.5	5,295,943.37	21.88	23.02
3-10-34	47	60,132	10,884	2,185	39.2	42.2	40.2	55.6	56.2	6,478,615.01	22.10	22.70
4-7-34	47	67,283	10,766	2,248	37.5	41.2	40.5	58.4	55.2	7,147,703.78	22.25	22.44
5-5-34	47	66,386	10,943	2,261	34.2	40.5	40.0	62.4	55.9	7,025,796.55	22.05	22.31
6-2-34	47	58,092	9,840	2,024	26.7	35.5	40.0	63.4	54.1	5,071,827.52	17.88	21.66
6-30-34	47	49,707	9,654	2,298	32.2	31.7	38.0	64.7	58.7	5,169,133.77	20.90	22.40
7-28-34	47	45,915	9,086	2,295	30.7	34.7	36.7	63.5	61.4	4,627,834.44	20.09	24.58
8-25-34	47	43,001	9,017	2,252	30.7	34.7	37.5	61.6	60.6	4,268,287.78	19.52	22.81
9-22-34	47	34,423	8,762	2,200	23.5	33.2	38.2	65.5	65.5	3,098,374.36	16.70	24.10
10-20-34	47	28,821	9,056	2,157	23.7	36.2	41.0	66.7	55.2	2,908,207.51	17.89	22.77
11-17-34	47	29,133	9,435	2,131	25.5	41.0	38.7	66.0	57.9	3,194,565.72	19.46	22.53

Summary Wage and Hour Reports 12 Replacement Parts Companies

4-Week Period End.	No. of Reports	Average No. Employees			Average Hours per Employee per Week			Average Rate per Hour		Total Payroll	Average Weekly Pay	
		40 Hr.	42 Hr.	Office	40 Hr.	42 Hr.	Office	Factory	Office		Factory	Office
12-16-33	12	1,537	164	325	36.0	37.2	41.0	48.0	50.0	\$147,372.79	\$17.57	\$20.75
1-13-34	12	1,520	145	363	32.7	37.5	36.2	48.6	52.2	135,536.97	16.21	18.98
2-10-34	12	1,523	152	370	37.7	40.0	38.7	49.4	50.1	154,836.89	18.07	19.50
3-10-34	12	1,665	174	367	39.0	41.2	39.5	49.2	49.9	171,709.45	19.39	19.80
4-7-34	12	1,781	178	376	39.5	42.2	40.0	49.1	49.7	183,596.56	19.59	19.97
5-5-34	12	1,811	185	388	38.2	41.7	40.0	50.4	49.2	185,974.25	19.45	19.72
6-2-34	12	1,790	190	388	36.7	39.5	39.0	50.9	50.3	180,072.72	18.87	19.68
6-30-34	12	1,749	218	382	36.7	35.2	40.0	52.1	50.0	180,978.42	19.45	20.08
7-28-34	12	1,622	182	373	34.5	37.5	38.0	53.3	52.9	164,546.65	18.62	20.22
8-25-34	12	1,614	185	363	36.2	37.5	39.0	53.8	52.1	170,745.65	19.61	20.39
9-22-34	12	1,450	178	362	34.7	36.7	37.5	54.6	54.3	154,159.16	19.13	20.40
10-20-34	12	1,525	179	359	37.0	39.0	39.5	55.9	50.9	171,130.47	20.86	20.16
11-17-34	11	1,274	177	345	37.7	39.0	39.5	55.5	50.8	150,642.87	21.16	20.13

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